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MESOPOTAMIAN TRANSPORT COMMISSION.

REPORT

OF THE

Commission appointed by the Government of India with the
approval of the Right Hon'ble The Secretary of
State for India, to enquire into questions
connected with the organisation and
administration of the Railway
and River Transport in
Mesopotamia.

(The maps referred to in this report have been printed separately and copies will
be issued on application only.)



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1918

TABLE OF CONTENTS.

	Page.
Terms of Reference and Names of Commissioners.	
REPORT.	
I. <i>General Description—</i>	
1. Basra	1
2. Rivers of Mesopotamia	3
3. Railways of Mesopotamia	6
4. Advanced Base	8
II. <i>Military Organisation for Control and Supervision of Transportation services</i>	8
III. <i>Tonnage Requirements and Capacity of Rivers and Railways</i> ..	10
IV. <i>Detailed Consideration of Present Conditions—</i>	
1. Organisation—	
(a) Inland Water Transport	10
(b) Railways	12
2. Personnel—	
(a) Railways	13
(b) Inland Water Transport	16
3. Local Labour	20
4. Operating—	
(a) Inland Water Transport	21
(b) Railways	27
(c) Comparative cost of I. W. T. and Railways, personnel and fuel	30
(d) Port Traffic	31
5. Commercial Traffic	32
6. Joint Workshops	33
7. General Stores	33
8. Utilization of Oil Fuel	34
V. <i>Future Developments</i>	35
VI. <i>Conclusions and Recommendations</i>	38

APPENDICES.

Inland Water Transport.

A.	
(1) Constitution of Fleet — 28th December 1917	41
(2) Proportion of self-propelled vessels to dumb-craft	42
(3) Steamers burning Oil Fuel	43
(4) Vessels yet to come from United Kingdom	44
(5) Distribution of Motor Boats	47
B.	
(1) Distribution of I. W. T. personnel week ending 29th December 1917.	48
(2) Manning of Fleet — Deck Crews	52
(3) Manning of Fleet — Engine Room Crews	56
(4) Marine Ratings employed ashore	58
(5) Statement of rejections of skilled labour at Dockyard between 27th July 1917 and 21st November 1917.	60
(6) Local skilled labour employed during 1917	61
(7) Lines of Communication Order <i>re</i> Local Labour	62
(8) Director's letter <i>re</i> sea-going ratings	64
(9) Statement showing Nos. of men on Strength and in Hospital 31st July 1917, and 22nd December 1917.	65
(10) Drivers of various Categories in Motor Boats	66

C.

(1) Length of Waterways operated by mechanically propelled vessels	66
(2) Length of Waterways operated by Native Craft	66
(3) Ton-mileage of self propelled vessels	67
(4) Ton-mileage of Native Craft	68
(5) Statement of steaming time and repair time of principal self-propelled vessels.	69
(6) Comparative statistics of Ton-Mileage and capacity of Fleet in November 1916 and November 1917.	70

D.

(1) Statement of tonnage discharged from sea-going ships	70
--	----

Railways.

E.

(1) List of Rolling Stock (Locomotives)	71
(2) List of Rolling Stock (Carriages and Wagons)	71
(3) Workshop Machinery	72
(4) Running Shed equipment	72

F.

(1) Present distribution of personnel (Officers)	73
(2) Re-organisation scheme (Officers)	77
(3) Effective strength of all Personnel for week ending 29th December 1917.	83
(4) Statement of rejections of skilled labour	84
(5) Quarterly statement of total local skilled labour employed during 1917.	84

G.

(1) Traffic operation statistics, section by section	85
(2) Coaching and goods earnings, Basra-Qurna-Amara. and Basra-Nasiriyeh Sections.	86
(3) Comparative statistics of Rolling Stock and Ton-mileage, section by section.	87
(4) Locomotive condition statement	88
(5) Note on the Locomotive Department	89

H.

New mileage constructed month by month	91
--	----

Local Resources.

J.

Local resources—Development	92
-----------------------------------	----

K.

Note on Port and Railway Development, Basra and Magil ..	100
--	-----

Maps.

Map of Mesopotamia shewing railways (Printed Separately).

Railway Map of Basra and Magil shewing tentative proposals for Port Development (Printed Separately.)

TERMS OF REFERENCE.

(1) Are the Railway and Inland Water Transport Directorates in Mesopotamia organised and administered on systems which ensure the most economical utilization of the labour — both skilled and unskilled — supplied to them consistent with efficiency and military considerations ? If not, what changes in Organisation and Administration are recommended ?

(2) Is Mesopotamia receiving its due share of personnel consistent with the claims of railways, shipping and manufacturing interests in India ?

(3) Applying the considerations mentioned in (1) is the organisation of Railways and Inland Water Transport in Mesopotamia such as to ensure that :—

(a) Excessive stocks of materials are not held.

(b) Demands from the various Directorates are co-ordinated.

(c) Machinery and tools and plant in workshops and elsewhere are utilized to the maximum extent.

COMMISSIONERS.

MAJOR-GENERAL H. F. E. FREELAND, C.B., M.V.O., D.S.O., *Chairman.*

MR. E. A. S. BELL.

MR. G. RICHARDS.

MR. A. J. CHASE, *Secretary.*

MR. JAMES E. ROY.

CAPTAIN E. F. DALDY, R.N.R.

SECRET.

MESOPOTAMIAN TRANSPORT COMMISSION REPORT.

FROM

THE MESOPOTAMIAN TRANSPORT COMMISSION,

TO

THE SECRETARY TO THE GOVERNMENT OF INDIA, ARMY DEPARTMENT.

Dated Basra, the 20th February 1918.

SIR,

In accordance with instructions conveyed in your letter No. 18348, dated 12th December 1917, we have the honour to submit the following report on questions connected with the Organisation and Administration of the Railway and River Transport in Mesopotamia.

CHAPTER I.

GENERAL DESCRIPTION.

1.—*Basra.*

2. Basra City lies back from the Shatt-el-Arab about 2 miles due West, and Basra City. its population was estimated prior to the war as being about 80,000 including suburbs. The principal of these were Ashar and Magil both close to the main river. Before the war all three places were notoriously unhealthy. There were also a few buildings on the river front, *i.e.* Sheikh of Mohammerah's palace and various Consulate buildings; with exception of these buildings, the town of Basra and the villages of Magil and Ashar, the whole area occupied by the present Base consisted of date palm gardens and open desert below flood level. Only two miles of roads existed and no attempt at any form of street lighting had been made. During the rainy season heavy traffic was impossible except on these two miles, and they also became impassable when used for heavy military traffic in wet weather.

3. The town has frequently been subject in the past to inundations. The nor- Flood protection, mal cause of floods is a strong south wind meeting a high river and spring tide.

The highest flood level was recorded on May 20th 1916, when it reached 8' 9½" above mean sea level.

The lowest low water levels for 1915-16-17 were recorded in November each year, being 2' 0", 2' 0" and 2' 4" respectively.

4. The whole base area has now been protected by bunds, the most important of which is the Shaiba Bund. This runs due West from Magil to the Shaiba Ridge, a distance of about 10 miles, with a mean height of 8' 6", and was commenced in January 1916 as a flood protection measure preventing the overflow of the Euphrates from inundating the country surrounding Basra, (Makina, Ashar and Magil). The bund is of mud reinforced with mats and corrugated iron sheets. It withstood the floods of 1916, was repaired and strengthened for 1917 and has now been further revetted to meet the flood-season of 1918. There has been no breach in the bund since its original construction.

5. To add to the disadvantages of Basra, from the point of view of a military base, several creeks, many of them of considerable proportions, intersect the river frontage and make communication difficult; when in addition to this it is remembered that accommodation had to be found for a large military population which is now over 100,000 strong, some idea will be obtained of the work which has been entailed.

6. Thirty-eight miles of roads have been constructed involving the erection of Roads. many girder bridges over the creeks. The first five miles of road had to be made of concrete owing to the difficulty of obtaining sufficient stone for the formation of macadamised roads.

7. The only water-supply existing when Basra was occupied was a very small Water-supply. one serving the Turkish Barracks at Ashar.

To supply the military needs 800,000 gallons were required daily during last summer, and it is expected that this will increase to 1,000,000 gallons in the coming hot season. This is provided by 8 separate pumping stations each fitted with an automatic chlorination system and sedimentation tanks are either provided or being provided in all cases. About 70 miles of piping have been laid and storage arranged for in high level tanks with a capacity of 320,000 gallons. All

systems are interconnected so that supplies can still be obtained in the event of the breakdown of any one plant.

Electric light and power.

8. Early in 1915 the necessity of providing electric light and fans for the Hospitals was realised and various small sets were ordered and installed. These were, however, insufficient and as the force grew, further installations became necessary, until it was realised that greater economy would be effected if a Central Power Station was erected. This is being done and the smaller sets freed for use at stations up-country. It has been found advisable to extend this system also to all wharves, stations, sidings and principal roads. Power is also provided to the Ordnance and Field Park Workshops.

Reclamation.

9. As a large proportion of the valuable river frontage was swamped in the flood season, it became necessary to reclaim such areas and make them suitable either for storage or other purposes.

The sites of the present Port Administration and River Conservancy Depôts, and the Isolation Hospital at Tanooma on the opposite bank of the river, as well as portions of the present Ordnance and Supply Areas in the neighbourhood of Magil have been reclaimed by dredger, and in addition 800,000 square yards has been reclaimed by donkey and light tram-line haulage.

Port.

10. The Port is situated on the right bank of the Shatt-el-Arab, 67 miles above a Bar at the head of the Persian Gulf and 46 miles below Qurna where the Tigris and one branch of the Euphrates meet to form the Shatt-el-Arab. The principal branch of the Euphrates joins the Shatt-el-Arab at Gurmat Ali near Basra. The river at Basra has a width of about 1,500 feet.

11. Although the nett tonnage of shipping which entered and cleared the Port before the war was over 300,000 a year, there were no port facilities of any kind; all vessels lay out in the stream and discharged into country boats or small lighters belonging to local firms and after their cargoes had been passed through the Turkish Customs these boats off-loaded to river steamers and flats for conveyance up the Tigris as far as Baghdad.

This was the condition of affairs when Basra was occupied in 1914 and it was not until the middle of 1916 that any wharves at which ocean-going vessels could lie, were commenced.

Wharf construction.

12. The first wharf (No. 11) was commenced on August 14th 1916, and was put into commission on October 3rd of the same year: the second (No. 6) was started on February 28th 1917 and was in regular commission on July 10th, a few ships only being berthed there during June. Three others (Nos. 5, 10 and 4) were commenced in August, September and November 1917 respectively, and are in commission now. Two others (Nos. 7 and 3) for which the piles were driven in December 1917 and January 1918 respectively are nearing completion, the former is practically available now and the latter, so far as wood-work is concerned, will be ready by the end of this month (February 1918), but its availability for berthing ships will depend on progress made in providing railway facilities and on the arrival of certain iron work due from India. Wharves Nos. 8 and 9 are small structures for up-river work; Nos. 1 and 2 have not yet been commenced.

Cargo discharge at Basra.

13. The earliest figures available are those for March-June 1916, supplied by Messrs. Gray Mackenzie who had a contract for discharging cargo and provision of labour. From June 1916 Port Traffic records are available.

1916.			Tons.	1917.			Tons.
January	..	..	No records.	January	..	..	79,085
February	..	..	No records.	February	..	..	93,639
March, 12th	..	..	No records.	March	..	..	98,073
13th March to 12th April	..	..	43,249	April	..	..	94,673
13th April to 12th May	..	..	57,540	May	..	..	90,504
13th May to 12th June	..	..	44,325	June	..	..	73,845
13th June to 30th June	..	..	22,554	July	..	..	84,559
June Port Traffic records	..	..	30,000	August	..	..	109,620
July	..	..	38,916	September	..	..	100,136
August	..	..	44,183	October	..	..	108,852
September	..	..	54,256	November	..	..	112,503
October	..	..	50,792	December	..	..	104,593
November	..	..	61,214				
December	..	..	81,123				
January 1918	..	..	131,838				

The drop in June and July is attributed to hot weather conditions.

The above figures, read in conjunction with the details of wharf construction, will shew that up to October 1916, 50,000 tons of cargo were being handled a month without the assistance of any wharves and all vessels were off-loading in the stream. From October 1916 until July 1917 there was only one wharf in use and the tonnage had increased from 50,000 to 80,000 or 90,000 a month at times. From that date much more attention has been paid to the question of wharf construction as has been shewn above.

14. As the Port of Basra was becoming congested a new site was found 21 miles up river at Nahr Umr where there is sufficient water close in for ocean-going ships. The main disadvantage of this Port is that it entails an extra 24 hours delay to each vessel and its further development is now under review for this reason. The following works have already been carried out :—

Three I. W. T. Wharves are in working.

No. 1 Jetty is completed.

Nos. 2 and 3 have not yet been commenced.

No. 4 is under construction and No. 5 is nearing completion.

2.—River.

15. On the outbreak of war the Turks sunk the buoys marking the channel over the Fao Bar, and removed the lightship which used to be moored about 5 miles outside the Bar to mark the approach to the river; this lightship was sunk at Satan's Gap, 5 miles North of Mohammerah, alongside the "Ekbatana" to assist in preventing our navigating the river beyond that point. The Shatt-el-Arab.

In Janary 1915, the Indian Government sent a small steam vessel to Mesopotamia to re-survey and buoy the channel across the Fao Bar, and at the same time a new light vessel was constructed in the Royal Indian Marine Dockyard, Bombay, and moored in position 5 miles outside the outer bar exhibiting an occulting light which was a very great aid to navigation.

At the end of the year 1915, three Gas Buoys were secured from Ceylon and laid to mark the channels over the outer bar, by this means ocean vessels could more easily negotiate the passage by night.

The light at Fao which was destroyed by the Turks was also, about this time, replaced in position, and this completed the facilities for navigation.

16. The mean breadth of the river is some 1,800 feet, between Basra and the mouth of the Karun, where it widens to half a mile and slowly increases to its maximum of nearly one mile at Fao, and ships are navigated by Pilots and Harbour Masters as far as Basra.

17. This Bar is now well marked by the universal system of buoyage, which includes three lighted gas buoys laid in such a position that navigation can be undertaken by night. Fao Bar.

The Bar itself is about 12 miles in breadth and vessels drawing over 11 feet have to await high tides when a maximum of 20 feet may be reached, but the depth of water over the Bar is dependent in some degree on the wind, a strong north wind considerably reducing it. From November to March the night tides are the higher; from April to October the day tides. Any vessel which can pass the Bar can proceed to Basra.

A Scheme has been formulated for dredging a deeper channel, but it is understood that this, after consideration, has been deferred until after the cessation of hostilities.

18. Tides on the Shatt-el-Arab are stronger than the river current and a rise of 6 to 10 feet may be recorded at Basra, but salt water does not reach a point over 20 miles from the Fao Bar. Shatt-el-Arab Navigation.

The left bank of the river to a point about 2½ miles above the mouth of the Karun is Persian territory.

The Mahommerah Bar below the junction of the Karun at Mahommerah extends for over half a mile and is a series of sandy lumps in the middle of the river; a good broad channel lies towards the right bank of the river, and this Bar cannot be considered as presenting any serious obstruction, being easily removed by dredging to a navigable depth of 20 feet.

The Gurmat Ali Bar, situated some 12 miles North of Basra, opposite the Northern Euphrates Island, is about 600 feet in length and 100 feet wide; the depth is changeable, but it may be assumed that not less than 12 feet would be found at L. W. S.

From Basra to Qurna (46 miles) the Shatt-el-Arab has a varying width from 750 to 1,800 feet with a general depth of 3 to 6 fathoms, excepting on a low tide when the Qurna Bar may constitute a temporary obstruction.

The Tigris.

19. Throughout the whole of its course above Qurna, the Tigris has only two tributaries between Samarra and Qurna, the Adhem and Dyala, a few miles above and below Baghdad respectively.

At the time of Colonel Chesney's Survey in 1837-38 the Euphrates and Tigris had direct communication through the Saklawiah Canal, which left the Euphrates above Felujah and joined the Tigris 5 miles below Baghdad *via* Lake Akar Kuf.

The Saklawiah was closed some 46 years ago as a preventive measure against floods, but the dam was destroyed by the Turks during the military operations in 1917, shortly after our occupation of Baghdad. Protection measures have, however, recently been taken, and the Canal is again closed.

20. The Tigris is normally at its lowest during September-October and begins to rise with the winter rains in December, but it is subject to sudden and considerable falls between then and March. The Flood Season proper sets in about the middle of March with the melting of snow in the hills.

During flood vast quantities of water spread over the surrounding country from Baghdad downward, and during the low water season a considerable volume of water escapes from or is drawn off the river through the hundreds of irrigation canals and ditches on either bank, particularly in the lower reaches. The consequence of this draining off of water by large canals, like the Michriyeh and Cahyala and minor irrigation canals, combined with the absence of any tributary streams below the Dyala, is that the cross sectional area of the Tigris below Amara is considerably less than at Kut or even at Baghdad.

The normal velocity of the river has been estimated at about 2 miles per hour.

21. The following note from Colonel Chesney's report (1837-38) is of interest as indicating the very extraordinary deterioration which has taken place during the past eighty years both on the river and in the surrounding country.

Writing of what is now known as "The Narrows" he states:—

"The river flows between high and well wooded banks winding very much, and varying in breadth from 600 to 1,200 feet, with an average depth in low water season of 12 to 36 feet."

Compared with this, at the present time the banks are desert or marsh, the river is only about 200 feet in places and the average mean depth varies from $4\frac{1}{2}$ to 7 feet.

Tigris Navigation.

22. The distance from Baghdad to Basra is approximately 498 miles by water and 346 by land route, an indication of the tortuous nature of the navigable channel.

The principal difficulties of navigation, apart from draft restrictions, which vary from 3 to 6 feet, are due either to shifting banks—particularly apt to occur on the third section of the river Kut-Baghdad and to narrow and short reaches having sharp bends especially on the first section between Qurna-Amara generally known as the "Narrows."

The strength of the current varies according to the season and locality. The strength during the low water season varies from $1\frac{1}{2}$ to 3 knots, and during floods and freshets from $2\frac{1}{2}$ to 4 knots, increasing to 5 knots in sharp bends and narrow channels. Above Siniyaj, 90 miles above Baghdad, a current up to 6 knots has been

reported over the fords. River bottom above Siniyaj is composed of conglomerate rock, boulders, gravel and stone, but the remainder of the river is entirely free from snags of any kind down to Qurna.

23. While exceedingly valuable results were derived from bandalling during 1917, for various reasons, such as lack of sufficient personnel, craft, equipment, material, delay in starting operations and poor quality of material supplied, these operations can only be considered in the nature of a demonstration of what could be effected in improving the navigable conditions on the Tigris during the low water season. In the Mandalayih, Kut Monument, Sharshar, Dabuni, Shudhaif, Owain and Hinaidi reaches, channels were deepened by 2 to 3 feet, and it is hoped that in the coming low water season the channels will be deepened throughout to take vessels of 5 feet draft as against a maximum of 4 feet draft in the past.

24. Proceeding from Qurna, the Tigris gradually decreases in breadth from about 1,000 feet at that place to roughly 400 feet at the entrance to the "Narrows," 5 miles North of Ezra's Tomb, and the whole reach is a series of long angular bends, of which "Sarifa" "Sacricha" and "Hurriyam" are difficult to negotiate owing to their sharp right angle turns.

First River
Section Qurna to
Amara (92½
miles).

The navigable channel remains good right up to the entrance of the "Narrows," a depth of at least 18 feet being maintained.

The stretch of waterway, extending from a point 5 miles North of Ezra's Tomb to the Mirchirya Canal, situated 4 miles North of Qualat Saleh, is termed the "Narrows" and restricts traffic considerably.

25. Two steamers with barges cannot pass each other in the "Narrows" and when it is necessary for "crossing" to take place, one steamer has to bank in and drop her barges astern while the steamer which has the right of way proceeds.

To regulate traffic a system of control is instituted between the Northern and Southern boundaries of the "Narrows."

A number of specially trained sappers are also stationed here for the purpose of piloting vessels through, and as the bends have been recently illuminated by electric light, navigation by night is possible for vessels without search-lights.

There are five control stations, each connected by telephone to each other and each fitted with signalling apparatus by which ships are directed.

26. At Amara, whilst the main stream of the Tigris takes a sharp turn to the Westward, the Chayals Canal takes off at the angle of the turn to the Eastward and carries off a large proportion of water from the main stream. In order to obtain a greater depth of water in the Narrows, efforts were made to partially dam the Chayala Canal. To effect this a steamer was sunk in the mouth of that Canal, but instead of producing a greater depth of water in the Narrows the only effect was to increase the velocity of the current in the lower section. This obstruction is now being removed.

27. All carriage of stores and material between Amara and Kut is effected by river, the railway communication from Basra terminating at Amara.

Second River
Section Amara-
Kut (151½ miles).

The river varies in width between 800—1,000 feet on this section over which the navigation is easier than on any of the others.

28. All channels and crossings between Amara and Kut are buoyed and marked by transit marks wherever requisite, commencing at a distance of approximately 40 miles above Amara. The Amara-Kut section is divided into three sub-sections with an officer in charge of each during the low water season; this officer controls shipping and maintains the efficiency of the navigational aids, such as buoys and transit marks.

Buoying and
Bandalling at
Ali Gharbi and
Sheikh Saad.

Bandalling on Mandalayih Reach during September, October, November and December 1917, effected very useful work increasing the depth of water.

29. During 1917 low water season, river traffic ran from Amara to Kut, with practically no interruption or delays due to groundings. The few delays that did occur were only of short duration and happened principally during September,

when the lowest depth, 5 feet, was experienced. This result was largely on account of careful regulations governing river traffic, and also due to shipping being directed through definite channels, thereby assisting them to scour out and improve.

30. Near Ali Gharbi a certain amount of water reaches the Tigris from the Pusht-i-Kuh hills but it is negligible in its effect on the depth of the river.

In the neighbourhood of mile 149½ (2 miles below Kut) shifting sand banks are encountered and extensive shoals exist towards the left bank on approaching Kut.

31. The low water season which extended from July 1917, to January 1918, was remarkable as a record; river levels at Ali Gharbi, which may be taken as a fair indication of the depth of the whole river, were, during July 1917, 2 feet 9 inches lower than the previous year on the same date, and maintained that comparative depth throughout the season. The first rise also occurred about 17 days later than usual in the Spring of 1917.

Third River
Section
Baghdad
miles).

Kut-
(204

32. The railway at Kut relieves the pressure which falls on the river carriage on the second section. The distance by water from Kut to Baghdad is 204 miles as compared with 112 by land, and the windings of the river are frequent with elbow bends and considerable stretches forming deep loops of varying width. At mile 73½ the river bends sharply, forming a difficult low water shallow reach for nearly 7 miles.

There is an average of 4 feet low water reading throughout this section and navigation is difficult in several of the reaches, especially between Aziziyeh (102nd mile) and Diyalah (184th mile), where water is liable to drop to as low as 3 feet.

Innumerable canals and irrigation cuts join the river throughout this section.

General.

33. In an average year the first rise in the river may be expected from the middle to the end of November, but channels begin to improve earlier than this. The effect may be noticeable in October and from that month until May the river should provide sufficient water for normal draft inland-water vessels.

The lowest water month is September.

During April and May "guttras" are frequent; these are sudden squalls of hurricane force which often necessitate the removal of all loose awnings and roofings. These "guttras" are experienced most frequently between Ali Sharghi and Sweara and all small craft have to tie up while they are blowing.

34. Each section of the river, as before detailed, has its own establishment of Pilots (Arabs locally enlisted who have had sailing craft experience on the river, and they assist the Commanding Officers of vessels in piloting the ships over the stretches of which they have special local knowledge.

The system of buoying and marking crossings by means of transit marks is carried out on the same principle except that officers are in charge of sections, and survey the area for which they are responsible at least once every 24 hours, altering buoys or marks as necessary in accordance with any changes in the formation of the channels that they observe.

3—Railways.

General.

35. Prior to the British occupation of Mesopotamia the only railway existing in the area was the Baghdad-Samarra section of the 4'8½" inches Turco-German Baghdad Railway, on the right bank of the Tigris. Since the commencement of military operations three separate groups or island systems of railways have gradually been developed. First, a metre gauge system connecting Basra (Makina) with Amara on the Tigris, and with Nasiriyeh on the Euphrates. Second, another metre gauge system connecting Baghdad (Hinaidi) with Kut on the Tigris and Baqubah on the Dyala. This latter line has a 2' 6" extension to the foot of the Jebel Hamrin Mountains, which extension, together with its existing branch to Abu Saida and projected branch to Deltawa, will shortly be converted to metre

gauge. Third, a 4' 8½" branch from Baghdad to Feluja on the Euphrates now being extended to Dibban.

36. The first of these lines to be built was that from Makina to Nasiriyeh. **History.** Military considerations at the time necessitated a concentration of force in that direction.

This was followed by a 2' 6" railway laid alongside the road connecting Qurna with Amara and following very closely the path of the river thus necessitating frequent sharp curves. This was subsequently converted to metre gauge as soon as material became available. The main object of this line was to relieve of certain traffic that section of the river offering the most difficulties to successful navigation.

With the advance from Kut to Baghdad in the summer of 1917 a further railway link was found to be necessary to supplement the carrying capacity over this section of the Tigris which is also difficult of navigation.

With the capture of Baghdad, railway projects developed rapidly and the Baqubah and Feluja branches were laid to feed the right and left wings of the Army respectively.

Further to improve the capacity of the Lines of Communication at its lower end, and to develop the new Port of Nahr Umr, a metre gauge line was built northwards from Nahr Umr to Qurna and ultimately extended southwards to Makina, thus completing the link in the Southern group.

37. The map (Appendix K) shows the general alignment of the various railway **Alignment and** systems and the mileage of each. With the exception of the Nasiriyeh line which **length.** follows the German location, and the Feluja branch, the railways follow the rivers along which they are built very closely.

38. Except for the German peace-built Baghdad-Samarra line, which is on an **Construction.** 8-foot bank for the greater part of its length, well built and ballasted throughout, and the larger part of the Makina-Amara line, which is probably safe from normal flood action, though not from high floods, all the lines laid are practically surface lines and with the exception of the Makina-Nasiriyeh branch depend for their security from flood on the protection afforded by the River Bunds and Emergency Breaches. The efficacy of this protection has yet to be tested.

39. The Makina-Nasiriyeh section, laid when railways in Mesopotamia were in the initial stage before the shipping tonnage question became vital, is built of 75lb. rails laid on broad gauge sleepers, so that with the minimum of trouble it can be converted from metre to 4' 8½" gauge when the time is ripe for its connection with the Baghdad-Samarra system.

Later metre gauge lines are all of lighter rail 41½ and 50 lbs. and metre gauge sleepers. It is hoped before long to eliminate the 41½ lb. rail on the main lines and thus permit of the use of heavier locomotives and consequently heavier train loads.

None of the metre gauge lines is ballasted.

40. The danger of flood action has already been touched upon ; one other menace must be noticed. The soil of Mesopotamia mostly consists of an extremely finely divided marl, practically impervious to water, with the result that a shower of rain converts a dusty desert into a slippery quagmire in an incredibly short space of time.

Washouts due to this cause on the surface lines are very common during the winter rains and will continue to be a danger until the lines are lifted on properly drained banks, which, owing to the shortage of labour, is probably not a war proposition.

41. Except on the Qurna-Amara section, where the curves have already been noticed, there are no curves or gradients of any importance.

42. As is to be expected in the case of rapidly built military railways, there **Bridging.** are few bridging works of importance. There are numerous culverts and short pile or trestle bridges across creeks and river spills, but the only bridges of import-

ance are an elaborate 400 ft. floating pontoon bridge across the Euphrates at Gurmat Ali, at present a very great limitation to the traffic since the river is tidal ; a single span 150 ft. girder bridge across the Shaffi Creek a few miles south of Qurna ; a pile bridge 800 ft. long across the Euphrates at Qurna with a 60 ft. span which can be floated out if necessary and two smaller swinging spans to pass ordinary traffic and two high pile and trestle bridges across the Dyala, one on the Kut-Hinaidi and the other on the Hiraidi-Baqubah sections, both of which have already proved very difficult to maintain due to the scour action of the Dyala in flood.

Equipment.

43. When Samarra was captured, a considerable portion of the rolling stock was taken undamaged, and with this, by effecting repairs where possible to damaged stock, and importing a dozen engines from England and India, the traffic on the 4' 8½" group is worked without difficulty.

All the equipment for the metre gauge lines has been imported from India, as also all the personnel except a few which have been locally recruited or combed out of the fighting troops.

44. With the exception of rare cases where water is obtained from wells, it is drawn either from the rivers or canals, but before it can be used, this water ought to be passed through settling tanks to eliminate the silt. Dirty water has been, and still is, a very fruitful source of engine trouble.

Operation.

45. Generally the lines (all of which are single) are operated on the telegraphic line clear system ; there are two exceptions, the Feluja and Baqubah branches, where the telephone is largely used.

46. The Lines of Communication consist of the River Tigris, 500 miles in length, between the Base Port, Basra, and advanced Base, Baghdad, and three separate and unconnected groups of railways of three different gauges, but metre gauge only as far as Advanced Base with a break of about 150 miles.

47. Advanced Base is located on both banks of the river. The section on the left bank is at Hinaidi, some 3 miles south of Baghdad by road but, owing to a big bend, some 13 miles by water from the section on the right bank, which is about two miles south of Baghdad by road.

Advanced Base on the left bank was located as the nearest convenient site to Baghdad which could both be served by rail and at which steamers and barges could lie alongside. Similarly the location on the right bank was the nearest convenient site to Baghdad for steamers, and railway connection was easily arranged.

48. Supplies arriving at Hinaidi by rail, and intended for the Advanced Base, right bank, have to be transhipped into barges and conveyed thence by water ; and, of course, supplies destined for places beyond Baghdad and brought thither by boat must be off-loaded and dumped, if not at once transhipped on to rail.

42. The railway lay-out at both places is end-on grids. On the right bank the railway grids are brought close down to the bank of the river. On the Hinaidi side they are stopped off very short of the river bank with consequent increased lead between dumps and river, necessitating employment of more labour than would otherwise be necessary. The whole railway lay-out at Hinaidi is under consideration.

CHAPTER II.

MILITARY ORGANISATION FOR THE CONTROL AND SUPERVISION OF THE TRANSPORTATION SERVICES.

Procedure laid down in Field Service Regulations.

50. In accordance with the provisions of Field Service Regulations, the Inspector General of Communications is responsible to the General Officer Commanding-in-Chief throughout the whole Line of Communications for the control and co-ordination of all traffic and for the punctual movement of the Army's requirements by rail, road or inland waterways as the situation may demand.

The same regulations lay down that the Directors of Administrative Services and Departments, among whom are included the Directors of Inland Water

Transport and of Railways, are responsible, subject to the general supervision and control of the three principal Staff Officers or of the Inspector General of Communications for the methods employed in meeting the requirements of the forces in the field.

It is also expressly stated that when a Director accompanies General Headquarters a Deputy will usually be on the Lines of Communication and *vice versa*.

And lastly, the Regulations explain that the responsibility for dealing with questions relating to Railway and presumably to Inland Water Transport rests with the Quartermaster General's Branch of the Staff by whom a ruling will be obtained, in consultation with the General Staff, in all cases of precedence to be given to conflicting demands for transport.

The above briefly covers the question of transport on the Lines of Communication for the provision of which a Director is responsible.

51. As regards the extension of existing means of communication the Regulations state that the Director of a Transportation Service, *e.g.*, Railways, looks to the Inspector General of Communications for his instructions in the matter of new construction.

As it is laid down, however, that the Chief of the General Staff is responsible to the General Officer Commanding-in-Chief, for working out all arrangements and drafting of detailed orders regarding all plans for concentration, distribution and movement of troops and material by rail or inland water-ways in the theatre of operations, and is also responsible for inter-communication in the field, it may be inferred that the instructions for forward railway construction and for the opening up of water-ways in the advanced areas, will emanate in the first instance from him.

52. In this theatre of war the Director of Inland Water Transport is located at the Headquarters of the Inspector General of Communications with a Deputy at General Headquarters, whereas the Director of Railways accompanies General Headquarters and his Deputy remains with the Inspector General of Communications. Procedure adopted in Mesopotamia.

Prior to the capture of Kut and the advance on Baghdad, the Director of Railways had his headquarters at Basra, but in view of the necessity of concentrating on rapid forward railway construction the late General Officer Commanding-in-Chief decided that the Director of Railways should accompany General Headquarters.

53. The procedure adopted for the control and supervision of the Transportation Services in Mesopotamia is that the Directors of Railways and of Inland Water Transport receive their instructions for the development of their respective facilities and for the movement of traffic on the Lines of Communication railways and waterways, up to and including rail or riverhead, from the Inspector-General of Communications, while orders for new construction beyond railhead or the opening up of waterways beyond riverhead are communicated through the Deputy Quartermaster General.

The latter officer also at the present moment has direct charge of the Inland Water and Railway Transport arrangements, which are being carried out in the Euphrates Valley, for the development of the agricultural areas in that district.

54. It has just been decided to create a new Transportation Directorate, namely, that of the Port, which will also come under the control of the Inspector-General of Communications and a recommendation has gone forward from the General Officer Commanding-in-Chief that the Inspector General of Communications shall be assisted by an officer of technical experience, who will act as his Deputy in all matters connected with Transportation.

We approve of this recommendation and we hope that the Deputy Inspector General of Communications will eventually develop into a Director General of Transportation, who will control all the Transportation Directorates under the direct orders of the General Officer Commanding-in-Chief.

CHAPTER III.

TONNAGE REQUIREMENTS AND CAPACITY OF RIVERS AND RAILWAYS.

55. Allowing for the purchase of local produce as at present obtained in this country, the daily requirements in stores and materials of the present force are as follows :

	Tons per diem.
(a) Imported into the country	4,051
(b) Consumed at the Base or going to reserve	1,179
(c) Required to be transported by river and rail to Amara	2,872
(d) Consumed at Amara	626
(e) Required to be transported by river to Kut	2,246
(f) Consumed at Kut	425
(g) Required to be transported by river and rail to Hinaidi and Advanced Base (Right Bank)	1,821

The figures under (c), (e) and (g) do not include reserves, the volume of which varies in the different categories according to the imports from Indian or other ports.

56. If the scheme for developing the local resources in the Euphrates Valley (see paragraph 211) is fully successful, 463 tons a day may be deducted from the figures under (a), (c), (e) and (g) above.

57. When the railways between Basra and Amara and between Kut and Hinaidi have been strengthened and fully equipped, they will be able to carry 2,000 tons a day over each section, instead of the present estimated maximum tonnage of 1,280.

On the above assumption, as soon as the River Fleet has been completed up to full programme, and considering that all stores and material must be carried by river from Amara to Kut, owing to the absence of railway facilities over that section the following tonnages can be carried by river :—

	Tons per diem.	
Basra to Amara	1,294	} Exclusive of tonnage required for Fleet main- tenance.
Amara to Kut	2,930	
Kut to Advanced Base (Right Bank)	684	

ORGANISATION.

Inland Water Transport.

58. The Directorate is organised at present, as follows :—

The Director at Basra, who, under the Inspector-General of Communications, controls the whole organisation.

Two Deputy Directors, one at Basra and one at Baghdad. The Deputy Director at *Basra* acts as assistant to the Director. He is a consulting Engineer and provides Technical Engineering advice.

The Deputy Director at *Baghdad* controls all Inland Water Transport working in the Tigris area from Aziziyeh to riverhead, and reports on same to the Director.

He also controls all Inland Water Transport working in the upper Euphrates area under the general control and supervision of the Deputy Quarter-master General.

Seven Assistant Directors. All at Basra.

The Assistant Director *Construction* has charge of all Inland Water Transport construction in Basra Area including construction of buildings, jetties, wharves, tanks, slipways, etc.

The Assistant Director *Personnel* deals with Inland Water Transport imported labour, takes delivery of labour on arrival at Basra, has charge of the Inland Water Transport labour camp, accounts for and distributes all labour and deals with re-engagements or repatriation.

The Assistant Director *Port Traffic* deals with discharge of sea-going ships at Basra and Nahr Umr and controls the fleet of Port Barges.

The Assistant Director *Dockyard* is Superintendent of the Dockyard, dealing with work as specified by the various Departments.

The Assistant Director *Conservancy and Irrigation*. This Assistant Directorship is being re-organised. Irrigation work is to be removed from the control of the Inland Water Transport Directorate.

The Assistant Director *Up River Works* deals with construction of wharves at Nahr Umr, construction and upkeep of floating bridges up river, construction of buildings, tanks, etc., at up-river stations, general up river engineering work and controls all up river workshops.

The Assistant Director *Native Craft* arranges employment of all native craft

Seventeen Deputy Assistant Directors.—The Deputy Assistant Director *Transport* works the fleet, keeps records of traffic and of the fleet, is responsible for coal and oil depôts and issues at Basra, and for the barge depôt.

The Deputy Assistant Director *Marine Engineering* is responsible for the engines and boilers of all vessels and instructs the Assistant Director, Dockyard, as to what work is to be done to engines and boilers. He controls the Engine Room crews after they have been handed over to him by the Personnel Department.

The Deputy Assistant Director *Vessels* is responsible for the condition of the Hull and deck arrangements of all vessels and instructs the Dockyard as to what work is to be done to the vessels. He controls the deck crews after they have been handed over to him by the Personnel Department.

The Deputy Assistant Director *Motor Repair Dockyard* is in charge of this establishment, which is to be removed to the Main Dockyard. The Deputy Assistant Director will then become an assistant to the Assistant Director, Dockyard.

The Deputy Assistant Director *Buoyage and Pilotage* is responsible for the pilots on the river above Gurmat Ali. He deals with the buoying and marking of the river, with bandalling operations, with recording of river levels and changes, with all salvage operations and for any dredging the Inland Water Transport may undertake.

The Deputy Assistant Director *Re-erection Magil* has charge of the re-erection yard at Magil.

The Deputy Assistant Director *Amara* has general charge of all Inland Water Transport working at Amara and on the section Ali Gharbi to Micharyia Canal.

The Deputy Assistant Director *Kut* has general charge of all Inland Water Transport working at Kut and at river stations from Aziziyeh to Sheikh Saad.

The Deputy Assistant Director *Stores, Magil*, is responsible for the main stores at Magil and for issue to all departmental depôts in Basra and up river.

Eight other Deputy Assistant Directors are Assistants in various Departments.

Two Superintendents.—The Superintendent of *Harbour Tugs* controls all Harbour Tugs in the Basra Area, the Motor Boat pool and floating fire service.

One Superintendent of *Accounts*.

In addition to the above there are Inland Water Transport officers in charge of Filtration and Refrigeration at Magil, in charge of the Narrows control and of

certain up river stations within the areas controlled by the Deputy Director, Baghdad, and the Deputy Assistant Director at Amara and Kut.

59. All the above officers report weekly to the Director. A conference of the senior officers in Basra is held weekly when matters of general interest are discussed with the Director.

60. The organisation is on a very complete departmental system. We consider it suits the conditions under which the Inland Water Transport works. The fact that no less than 28 officers report direct to the Director suggests that the system is too centralised, but this is not the case. Many of the reporting officers merely send necessary statistics. The self-contained departments dealing directly with the Director number thirteen, and although even this is a considerable number we consider the arrangement is an efficient one.

(b) *Railways.*

61. The existing organisation is that of a Director at General Headquarters, with a Deputy at Basra ; reporting directly to the former are—

- (i) the two Assistant Directors of the lines centring on Baghdad and also (in urgent matters) the Executive Engineers in charge of new construction in the area round Baghdad ;
- (ii) the Locomotive Superintendent of the broad gauge lines ; and to a limited extent ;
- (iii) all heads of departments stationed at Basra.

As regards the Traffic Department for the lines centring on Baghdad, the Deputy Traffic Superintendents although under the orders of the Traffic Manager, who is stationed at Basra, have (on urgent matters) direct communication with the Director's office owing to the time it would take to convey the orders of the latter to the Traffic Manager and thence back to the various Deputy Traffic Superintendents.

Under the orders of the Deputy Director are—

- (i) the Superintendent of Way and Works for the lines centring round Basra or what may be called the Southern Group ;
- (ii) the Locomotive Superintendent of the metre and 2' 6" gauge lines ;
- (iii) the Traffic Manager of the whole system ;
- (iv) the Chief Store-keeper ; and
- (v) the Assistant Director at Basra who deals with the importation of personnel from India.

Finally, there is an Assistant Director of Railway Transport who is under the orders of the Deputy Director at Basra but representing Railway Transport with the Headquarters of the Inspector-General of Communications and utilised by the latter as a means of obtaining information and advice on railway matters and also for the purpose of communicating orders for Railway Transport to the railway staff. Under this officer are placed all the Railway Transport Officers on the railway. It may be noted that the Assistant Director Personnel and the Assistant Director, Railway Transport, also correspond direct with the Director of Railways and that their jurisdiction extends over the whole system.

62. In examining the existing organisation three important factors have to be continually borne in mind :

- firstly*, the necessity for the Director to be in close touch with General Headquarters ;
- secondly*, the fact that the two groups of lines round Baghdad and Basra respectively are separated by a gap of about 150 miles ; and
- thirdly*, the length of time which letters take to pass between Basra and Baghdad.

It is essential that the Director should be in close touch with the General Staff in order that he may be in a position not only to obtain early and timely advice of what the railways will be expected to do, but further to be consulted when plans of operations are being framed, and if necessary, to have them modified whilst they are still maturing so that they may be in conformity with the capabilities of the railways.

The existing organisation is undoubtedly a growth and not a preconceived system. Such growths are nearly always bound to occur under the rapid changes incidental to war conditions where developments arise in unforeseen directions at short notice. It has to be adapted to the personalities of the individuals employed. Such growths, however, require periodical revision and it would appear that a suitable time has now arrived.

63. Amongst the anomalies at present may be pointed out the fact that the boundaries of the various departments are not coterminous, *i.e.*, there is one Traffic Manager of the whole system but two Locomotive Superintendents; one of these controls the Locomotive working of all metre and 2' 6" lines (including the line from Baqubah to Table Mountain, although he is stationed at Basra); and the other controls the standard gauge lines and is stationed at Baghdad. Unlike the Traffic and Locomotive Departments there is no separate head of the Engineering Department but the Director himself administers engineering questions.

64. We regard the appointment of a member of the Deputy Director's staff to act as technical adviser to the Inspector General of Communications as liable to lead to friction, and unsound. In order to give advice to the Inspector-General of Communications this officer must have technical knowledge in all departments and it is always likely that the Assistant Director, Railway Transport, may be pressed by the Inspector-General of Communications into giving technical advice which may not be in accordance with the views of the Deputy Director who is responsible for carrying out the work. We are of opinion that under the existing organisation the Deputy Director should be the officer to whom the Inspector-General of Communications should refer on railway questions.

65. As stated in paragraph 62 above the organisation just described is a growth. Before the advance to Baghdad the whole of the Railways were centred on Basra and were suitably worked on the departmental system. When the lines centring on Baghdad were added, the departmental system became unworkable and an attempt appears to have been made to graft the divisional system on to it.

66. A certain amount of re-organisation has recently been undertaken and a scheme has been drawn up for working the Railways on a purely divisional system. We thoroughly approve of this scheme. Appendices F(1) and F(2) shew details of the existing organisation and of the proposed Divisional Scheme.

2.—PERSONNEL.

(a) Railways.

67. The Divisional scheme outlined in Appendix F (2) has been drawn up during the present month by Colonel R. Oakes, who has been officiating as Director of Railways *vice* Brigadier-General G. Lubbock, since 14th December, 1917. The Director of Railways.

68. Appendix F(1) shews that under the existing organisation there are far more officers on the Mesopotamian Railways than on any railway system of the same length in India. Utilisation of Railway Officers and high rates of supervision.

We should not compare the Mesopotamian Railways with any old-established Indian Railway which is fully equipped and ballasted but with a new line which has been opened for goods traffic at the earliest possible moment.

Even with this proviso the Mesopotamian Railway scale of personnel appeared to us to be extravagant; the staff which works only 35 or 40 miles of line in Mesopotamia would be considered ample for 80 to 120 miles (*i.e.*, the length of two construction divisions) in India.

69. The principal reasons for this difference in the length of districts appear to be the following:—

- (i) A reserve has to be maintained to provide for the construction of new lines which may be suddenly demanded by the General Officer

Commanding-in-Chief (see Chapter V—Future Development, paragraphs 207—222 below).

- (ii) The reserve which should be retained on the spot for sickness and other casualties is much higher than in India.
- (iii) Much closer supervision of works in progress is necessary because there are few contractors employed in Mesopotamia and so nearly all work is done by daily labour : also because of the inferior quality of the skilled labour employed in Mesopotamia.
- (iv) Railway officers have to undertake certain Military and Camp duties.
- (v) Military conditions demand frequent changes and work has always to be done against time.

70. Regarding the provision to be made for (i) and (ii), the Director of Railways must be the best judge : in Appendix F (2) the reserve is shewn separately : in actual practice the men who are nominally held in reserve will be, as at present (see Appendix F 1), distributed over the railway system wherever they can be usefully employed.

71. We discussed reason (iii) with the General Officer Commanding-in-Chief and Deputy Adjutant General at Baghdad, and with the Deputy Adjutant-General, 3rd Echelon at Basra, and we believe that arrangements will be made to bring back non-technical officers, non-commissioned officers and men from the fighting line to assist in the supervision of unskilled labourers employed on earth-work. If these proposals materialise we consider that railway engineers will be placed in much the same position as they would be in India when carrying out work by means of petty contractors. We feel that we cannot lay too much stress on this very important proposal.

72. The deputation of non-technical officers and British other ranks to supervise unskilled labour should be supplemented by the combing-out of Railway Officers and subordinates from the fighting troops and from other Services, such as the Inland Water Transport. This would tend to lessen the demands on India for additional railway-men, which will, we understand, be made in the near future on account of the proposed construction of new railways which are mentioned in paragraphs 210-221 below. We have impressed upon Colonel Oakes the fact that the number of trained railway engineers, which can still be obtained from India, is very small.

Skilled labour.

73. There is no reasonable doubt that the quality of skilled personnel compares unfavourably with that usually employed in India. The reasons for the inferiority are not difficult to find. It is impossible to compel Indians to serve outside India. Further, the rumoured lack of adequate housing accommodation, coupled with the fear of the unknown, tends to discourage men from engaging for service in Mesopotamia, particularly as separation from their families is entailed. It must also be remembered that the more experienced a man is, and therefore the greater his market value the older he is, and it is impossible to get the older men to volunteer for service. This results in the less experienced and younger men being recruited without the necessary proportion of more experienced men. Another difficulty, and a very serious one, is that occasions arise when the skilled man receives lower pay than a less skilled man and is therefore discontented.

74. To examine the disadvantages : separation from family, and the disinclination of the Indian to leave his home cannot be overcome. The questions of better housing, messing arrangements, etc., in certain cases require early consideration and though no large results may be expected from these for some time still, the knowledge that better conditions do exist must eventually react favourably on recruitment. The reasons which deter older and more experienced men from volunteering for service must always remain.

75. As regards anomalies of grading, this is a serious defect and one which it is not easy to overcome. Under existing conditions personnel is graded where it is recruited and where so many centres exist and rates vary between and in provinces in India, it is impossible to fix uniform scales of pay proportionate to

the market value of the individual. Also two recruiting officers would probably not rate particular individuals at the same market value. To get over this difficulty the obvious solution is to fix on one centre for the purpose of grading, but the difficulties in carrying out such a scheme appear to be insuperable.

76. Many complaints have been made and cases have actually come to our notice, of the bad quality of skilled labour and we are of opinion that more care should be exercised in carrying out trade tests.

77. The question whether Government and Business concerns are giving sufficient encouragement to their staff to volunteer for service in Mesopotamia is one that has been brought before us. It seems desirable that the requirements of Mesopotamia as regards competent skilled workmen should be brought frequently to the notice of all employers in India and that they should again be urged to give the matter their close and unremitting attention. It is not expected that all men recruited will be 100 per cent. men, but it must be remembered that owing to lack of machinery and equipment and very difficult conditions under which men work in Mesopotamia, it is essential that the best type available should be recruited. In this connection it is suggested that the average paid skilled workman and mistry should be recruited and not the lower paid in the grades.

78. It is important that foremen and chargemen should be first-class men and men on the minimum rate of their grades should not be selected. There should be no hesitation in bringing pressure to bear in cases where Europeans are reluctant to volunteer for service.

79. We recommend that all employés who volunteer for the duration of the war from Indian Railways should be promised special promotion if they rejoin with clean records.

80. We are also of opinion that there should be no hesitation in increasing the salary of any man who, after his arrival in Mesopotamia, proves himself to be worth more than the rate fixed by his agreement.

81. It might also be possible to ensure employment in Government Service on return to India of all staff who have engaged for the period of the war and who, prior to recruitment, were not in Government employ.

82. There appears to be a want of liaison between recruiting authorities in India and Directorates in Mesopotamia. We are of opinion that the Superintendent of Recruitment should proceed to Mesopotamia without delay, so as to get into touch with the authorities there, ascertain their difficulties and see what can be done to surmount them. Further we recommend not only that periodical visits should be paid by this officer to the theatre of war, but that steps should be taken to give selected officers and men proceeding on leave to India extra leave to consult the authorities there.

83. With reference to a comparison of the unskilled personnel with that usually employed on similar work in India and bearing in mind the military restrictions on classes recruited, no complaints have been received except as regards the physique and unsuitability for the climate of personnel recruited in Madras and Bengal. Unskilled labour.

84. We consider that more might be done in Mesopotamia to make service in that country more attractive to men from South India and Bengal; for example, they might be employed together as far as possible under men who are used to handling them and care should be taken to give them the food to which they are accustomed.

85. As regards the terms of service of personnel, these appear specially good amounting as they do to 50 per cent. above ordinary Indian rates. Certain improvements might be effected in housing, washing and messing arrangements. We believe that one of the causes of the inferiority in skilled personnel is the frequent change on account of short term agreement. We recommend that all agreements should be for not less than 18 months, preferably for the duration of the war, and that leave should be granted at the end of every twelve months. It is also suggested that the period of service should begin from the date a man actually arrives in Mesopotamia, though pay should commence from the date of his signing Terms of service.

the agreement. All inoculations considered necessary should be completed before a man leaves India.

86. We would also point out that more care should be taken to recruit men from classes already employed in similar work in India. In the case of men for whom service registers have been maintained, copies of such registers should be sent to Mesopotamia.

87. With reference to the question of re-engagement we are of opinion that the rates on re-engagement should be left entirely to the discretion of the Director who should give such increments as he may consider the men are worth. There are, however, other difficulties in the way of re-engagement ; for example, the rates of pay in Mesopotamia are very high as compared with those in India ; men save practically all the pay they earn and by the end of the term of their agreement have amassed a considerable sum of money ; having done so they wish to go home to their families and spend it. In many cases, however, men who have clean records re-engage in India and come out on a higher rate of pay, but several months may have elapsed before they do so.

88. There are not, as far as we have been able to ascertain, any classes of artisans or others in India which have not been employed in Mesopotamia.

(b) Inland Water Transport.

General.

89. At the end of 1917 the personnel employed in the Directorate of the Inland Water Transport was as follows :—

Establishment, all ratings	39,381
Attached and in Chartered vessels	8,242
Total ..	47,623

Appendix B (1) shews the distribution of the above personnel as on the 29th December 1917.

Supervision
Europeans.

90. The number of officers and British ratings employed in the Inland Water Transport Directorate at the end of 1917 was as follows :—

British officers	688
Royal Indian Marine officers	70
British non-commissioned officers and men	2,421
Civilians	10
Total Europeans	3,189
Anglo-Indians	485

91. Before dealing with this subject we should make it clear that in Mesopotamia the absence of experienced personnel, other than British, has resulted, up to the present in the employment of Europeans to an extent which must seem strikingly abnormal to Indian eyes. One experienced in Indian practice and methods would consider the employment of Europeans extravagant. This point might be best brought out by specific examples.

92. At Amara the Inland Water Transport establishment includes the following Europeans :—

Officers	30
Non-commissioned officers and men	124

Of these, 2 officers and 26 men are on up-river construction work and on the bridge as crew. At a riverine junction in India of the same size as Amara and doing practically identical work, both traffic and engineering, the European establishment would normally be—

Europeans	8
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93. The traffic work done at an Indian station so manned results in most successful commercial working, while the engineering up-keep of each vessel is to the yearly satisfaction of a Government Surveyor. At the Indian station the traffic involves detail check of cargo, supervision of a large passenger traffic and

a large amount of cash and accounts working, all of which are absent at Amara. A certain amount of outstation supervision is also given from the Indian stations taken as example. Night working is also common.

The example quoted proves conclusively that the work done at Amara could, under certain conditions, be done by a very much smaller staff of Europeans.

94. A second example might be taken from the Buoyage and Pilotage Department. The European establishment of this department at the end of 1917 was as follows :—

Officers ..	..	..	..	..	..	..	30
Warrant officers ..	..	..	..	..	..	..	3
British other ranks	..	..	..	..	..	..	42

The mileage of river dealt with from Fao upward is 776.

In India the Brahmaputra Marking and Piloting European establishment is as follows :—

Europeans or officers	4
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The length of river dealt with is approximately 1,000 miles and the river is much more changeable than the Tigris. Shoals are experienced in all parts of the river in the low-water season and are difficult to mark and navigate. Snags are numerous and have to be carefully located and marked, or removed. Bandalling is not done except in exceptional circumstances.

Comparisons of the above kind and to the same effect can be made in many departments.

95. Appendix B (10) shews the number of drivers of various categories working in Motor Boats. It will be noted that there are 91 British other ranks. We think this matter requires consideration if military necessity will allow of the manning being other than British. Apart from military consideration, and if there is urgent need for British man-power elsewhere, we consider much of this manning could be Indian.

96. In our consideration of the case of Amara, quoted as an example, we have not lost sight of the fact that much general work such as buildings, reclamation, erection of tanks, etc., is going on, and have shown the European personnel engaged on that work, but the opinion *re* incidence of really experienced and capable Indians and Europeans is not affected. In the case of buoyage and pilotage we have not lost sight of the fact that a large scheme of bandalling is to be carried out and how absolutely essential it is that the best should be done. Nor have we lost sight of the fact that the Buoyage and Pilotage Department do salvage work.

97. It seems to us that the position in regard to the Inland Water Transport in this connection can be stated clearly in the following way :—

- (1) The *total man* power is probably not excessive.
- (2) The ratio of Europeans to Indians is excessive in comparison with Indian standards.
- (3) If the operations were being conducted in a European country the man-power employed would be all European.

98. The position seems to have arisen in the following way. The working developed primarily and quite recently in the actual fighting area, and of necessity Europeans had to undertake every executive duty however unimportant. When fighting passed beyond the lower stations and sections and the conditions approximated more nearly to normal traffic working, which is, of course, quite recently, the European establishment remained.

If at this point the manning standard of good and successful practice in India had been aimed at, and approved by the Military authorities, success could only have been attained had it been possible to recruit and send out the experienced and capable Indians who make a low ratio of European establishment possible in India. It would also have been necessary to ensure that these Indians would not be short-term men.

99. The question seems to us to be one, not of mere man-power, but of British man-power as compared with Indian man-power. If the military authorities will accept the latter as substitutes for the former, their technical knowledge and experience being equal, and if India can supply thoroughly competent Indian artisans and the class of experienced Indian who takes charge of sections or departments in offices, of sections of workshops or sections of rivers, of riverine station transshipment, then much valuable and, some of it, highly technical British man-power can be released. Apart from the above the European establishment should, in our opinion, be reconsidered and closely scrutinized to see what possible reduction in these valuable ratings can be made by substitution of suitable Indians at present in Mesopotamia, who might, by advancement, be encouraged to re-engage. A case in point is engaging the attention of the Director. It had been pointed out to us that the establishment of Marine officers might be reduced. On referring this to the Director he advised us that steps had already been taken to this end by advancement of Indians, and he hoped, ultimately, to release about 90 officers in this department.

Marine ratings.

100. The total strength of the floating establishment of marine ratings, exclusive of British officers and British other ranks on 8th December, 1917, the latest date for which *detailed* figures are available, was 14,651 men. These were distributed as follows :—

Afloat	10,748
Ashore as reserve crews up-river and on special works ..	3,504
Reserve at Basra	399

101. These figures shew that in December only 72 per cent. of the marine ratings were afloat in steamers. It has been explained to us that marine ratings were indented for as the building programme was sanctioned and that a large number of the men now on shore will be drafted into the vessels still to come forward. There will of necessity be a considerable number retained on shore as crews for the floating bridges, and as mooring gangs at the more important up-river stations. A number will also be retained on work where lascar labour is necessary. It will also be necessary to keep a certain number of marine ratings in reserve up-river, but as railway communication with the main reserve at Basra improves the number necessary for this purpose will be reduced.

102. These figures further shew that there was at that time a considerable reserve of marine ratings in Mesopotamia and we are advised that the marine establishment will not have to be increased beyond what is at present in the country. Men will only be required to replace time-expired men who do not re-engage.

In explanation of the fact that the ratings had been brought over to Mesopotamia so much in advance of the vessels, we are advised that marine ratings were sent to Mesopotamia in excess of demands. It is also pointed out to us that there had been abnormal and unforeseen delays in completing vessels and sending them overseas. The excess men had been well employed on necessary work and the position had been allowed to stand.

103. Appendix B (4) shews how the 3,903 marine ratings referred to were employed. The statement shews that 1,300 men are servants of various kinds. It seems a mistake to include such men in marine ratings, and we have suggested that in future they should be kept in a class by themselves, and this is now being done.

The position as set out in Appendix B (4) is being gradually adjusted, but a current detail statement of marine ratings employed on shore is not available. The servant ratings have been taken out of the marine establishment and the number of deck and engine room ratings employed on shore has been much reduced. As pointed out in a previous paragraph there will always be legitimate work for a certain number of marine ratings on shore and this with a suitable reserve is now being aimed at.

We invited the attention of the Director to the number of servant ratings employed in various messes and camps on shore as shown in Appendix B (4). He advised us that this matter was being adjusted.

104. We have considered the advisability of returning sea-going ratings to India. Information in regard to the number of these ratings serving in the I. W. T. vessels was not available, but we have asked the Director to have a list of these men compiled and we consider they should be returned to India. Men of this kind are not required on the Tigris. Every kind of work on the river, *e.g.*, tending bridges, making of bunds, bandalling, buoyage, mooring at jetties, manning of barges and propelled vessels, can be better done by men from the river districts in Bengal, who are familiar with all the conditions of river-working. There is very little work in Mesopotamia that requires sea-going experience [see Appendix B (8)].

105. We also recommend that more active steps should be taken to prevent the recruiting of sea-going deck and engine room crews, especially from the Bombay side.

106. As a result of our enquiries it seems clear that the marine ratings sent out compare rather unfavourably with those usually employed in India. The responsible officers do not, however, complain of this and will be satisfied so long as the class of man from which inland marine ratings are recruited in India is sent out. The men can be trained and gain their experience on the vessels in Mesopotamia.

107. We learn that at the suggestion of the Recruiting Department in India, coolies are being put to learn trimmers work. This is being done with the idea of reducing the number of marine ratings to be indented for. The Superintendent Personnel advised us that he would have to recruit coolies to make up for the men transferred to trimming.

108. In regard to certificated ratings it has been pointed out to us that the failure to send records of service with the men greatly handicaps the responsible officers here in disposing of the men. This is a very important matter and steps should be taken at once to send with each certificated rating a copy of his record and a clear advice that he is certificated. The absence of such record has made it impossible for the officers here to fairly allot the men to suitable appointments. Failure to do so gives rise to grave discontent and must militate greatly against satisfactory recruitment.

109. The employment of Indian certificated ratings in command of vessels is being gradually extended. Command is now distributed as follows in mechanically propelled vessels other than motor boats:—

Steamers.

						Deck.	Engine Room.
British	..	..	..	..	..	148	168
Indian	..	..	..	..	..	87	46

Launches and towing launches.

						Deck.	Engine Room.
British	..	..	..	..	..	<i>Nil.</i>	<i>Nil.</i>
Indian	..	..	..	..	..	104	104

Employment of certificated Indians in command can be greatly extended. So far as safe and efficient navigation is concerned, and so far as military considerations will permit, there is no reason why nearly all vessels should not be gradually manned by Indians, if suitable men are selected and it is considered advisable to economise in British man-power to this extent. The largest vessels on the river were successfully commanded by Indians when working in India, and the conditions of navigation on the Tigris are not more difficult than those existing on Indian rivers. We would not recommend the employment at present of any Indian in charge of large internal combustion engines.

110. It has been suggested to us that there would be some difficulty in having Indians in command of vessels carrying troops. This does not seem to be a great difficulty. The position of the Indian in charge of the vessel could be well defined, and there need be no interference from the Officer Commanding troops on board with the well-defined and well-understood duties and liabilities of the Indian in

charge. Second class masters have on many occasions commanded the largest vessels in India when extensive mobilization of troops has been undertaken.

111. The manning of all vessels has recently been under consideration and certain reductions were decided on. When these reductions are effected the vessels will be reasonably manned so far as number of Indian ratings is concerned. Appendices B.(2) and B. (3) shew the crews as they will be when the rearrangement is completed.

Skilled labour.

112. What we have written about quality of labour and terms of agreement in paragraphs 73 to 88 referring to railway labour applies generally to Inland Water Transport labour also. All our enquiries go to shew that the average standard of skilled labour sent to Mesopotamia compares unfavourably with the average standard normally employed in India, and has not improved in any way up to date. Practically every employer of labour within the Directorate gives this as his experience and has shewn us much evidence in support of the fact.

113. Appendix B. (5) shews the rejections from the dockyard for approximately four months. The percentage of rejections is very high, amounting to an average of 41 per cent. in Indian labour and 46 per cent. in Chinese labour. We suggested to the Dockyard Superintendent that his test standard must have been very high, but he assured us that such was not the case, and that men were accepted if they could be employed at all. Next to the dockyard the Magil re-erection yard is probably the largest establishment and the Superintendent there, like the Superintendent of the Dockyard, has previous experience of Indian labour. His evidence was much to the same effect as that given by the Dockyard Superintendent, but he had not rejected any men except Chinamen. The Indians had been persevered with and working along with good men had gradually become more useful. The work at Magil being mostly rivetting and plating made perseverance with inefficient men possible.

114. Both of these large employers were particularly emphatic about the poor quality of Chinamen, and it is certainly remarkable that the Deputy Assistant Director, Re-erection, could persevere with Indian labour but found this impossible with some of the Chinese labour sent to him, which was absolutely useless.

115. Rejections up to a very recent date were returned to India without any further trial. The Personnel Department are now giving rejected men a second and third chance at different establishments and hope in this way to save a certain number of unfit men being sent back to India.

Housing and health of men.

116. Nearly all the Inland Water Transport camps were inspected and we find the men well housed, well fed, and well taken care of so far as health is concerned. The great bulk of the men employed are living under conditions which compare favourably with Indian conditions. A few men, probably about 15 per cent., are still under canvas. Housing arrangements for these men are in progress or being considered.

Appendix B (9) shews the number of men under various categories who were in hospital on a given date in July and December 1917.

CHAPTER IV.

3.—*Local Labour.*

Skilled labour.

117. Except at Baghdad skilled labour is scarce, but at that place a considerable number of artisans is employed whose quality is not of a very high standard, but is improving under British supervision in the shops. Wages demanded are high, and men are not inclined to work far from their homes. Considerable progress has been made in employing and training local skilled labour. Appendix B. (6) shews the progress made. The men are mostly Baghdadis and Armenians and it will be noticed that real progress in employment of this class of labour began in May after the taking of Baghdad. The up-river Works Department is exploiting this labour to the utmost and we were advised by the Assistant Director that the men are apt and willing, and that for skilled labour this source of supply may be relied on to provide a progressive number of skilled men. The wages of this class of labour is fixed by a Lines of Communication order which also provides for a test and classification of the

deserving men they wish to promote. Appendix B (7) is a copy of the Lines of Communication order referred to.

118. The Railway Directorate proposes to start a training school. Seeing that some machines would have to be set aside for a school, which would also occupy a building or part of one, and that expert supervision for instructional purposes is not very plentiful, it would appear that an apprenticeship served in an existing workshop is preferable.

119. Arabs, Kurds and Persians are recruited by the Director of Labour through Unskilled labour. Sheikhs and Makhtars who are told how many men are required. They are paid Re. 1 per head per mensem and are fined if the supply is not kept up. The men are sent to different Directorates as demanded, but the Director of Labour through his local Assistant Director of Labour keeps touch with them, and ensures that they are properly employed, and that they are returned to his control when the work for which they were demanded is completed.

120. The men are formed into companies of 100 each, by villages as nearly as possible, each company having one overseer and two sub-overseers. Ten companies form a Labour Corps which has a Commandant, Adjutant, Quartermaster Sergeant, Interpreter and Pay Clerk. The Sheikh or Makhtar who supplies a company of men is bound to send a representative to live with that company. Coolies are paid annas 12 per diem.

121. Piece-work is given where possible, but local contractors, being inclined to combine to raise rates, are not encouraged. At present about 67,000 men are employed and it is considered that this number cannot be increased without reducing the labour required for agriculture in the several localities from which the men have been recruited.

122. In spite of this limit to the number of men to be recruited the Director of Labour is of opinion that no more Indian labour would be required if greater economy were exercised in the use of the men whom he controls. He also contends that the out-turn of work is small owing to lack of European supervision, and is applying to General Headquarters for a number of non-commissioned officers and men whom he can utilise for this purpose. If such men can be spared from the Force, any inducement which might be sanctioned for encouraging them to pass a moderate language test, would be amply repaid by the extra amount of work obtained.

123. The stevedoring of ships at Nahr Umr is done by the Director of Port Traffic, who recruits his own labour in Bushire; the Director of Labour also recruits labour in this port and he considers that the whole of this work should come under his control.

124. It has been suggested that all Directorates should meet monthly in Baghdad to discuss rates for piece work, etc. If practicable, this would be an opportunity for discussing complaints and should greatly help smooth working and should check wastage.

OPERATING.

4.—(a) *Inland Water Transport.*

125. At the end of 1917 the fleet in commission and being operated by the Fleet. Inland Water Transport was as follows :—

Steamers, motor barges, hospital ships, etc.	..	..	..	339
Barges of all sorts	..	..	..	497
Motor boats	..	..	..	365
Hydro-Glisseurs	..	..	..	8
Evinrude boats	..	..	..	39
Special purpose barges	..	..	..	16
Special purpose vessels	..	..	..	2
Total	..	..	..	<u>1,266</u>

Appendix A (1) shews in detail the various types of vessels in commission. It also shews the vessels fitting out and the vessels still due to complete the whole programme of the sanctioned construction.

Mileage Operated. 126. The mileage operated by mechanically propelled vessels and barges at the end of 1917 was 739 as shewn in Appendix C (1).

General disposition of Fleet. 127. The extension of the Inland Water Transport working to Baghdad is so comparatively recent that practically nothing in the nature of established practice can be quoted. In the past high-water season the general arrangement was to base the main part of the fleet on Basra, while a smaller part of the fleet was based on Amara to work the ferry-service between the railway termini at Amara and Kut, and a few vessels were based on Baghdad.

In the past low-water season the main part of the fleet was based on Basra. Approximately 45 self-propelled vessels, with a suitable number of barges, were based on Amara to work the Amara-Kut ferry-service. Approximately 45 self-propelled vessels of light draft were based on Kut to take forward barges brought from Basra by the Basra based fleet. Approximately 35 self-propelled vessels, with a suitable number of barges, were based on Baghdad to work the traffic from the railway terminus at Advanced Base Left Bank (Hinaidi) to Advanced Base (Right Bank) and for such river carriage as was necessary beyond Advanced Base.

With the rise of the river the high water distribution has again been introduced, the Kut vessels being absorbed into the through working.

128. This system of operating the fleet is undoubtedly the best possible under the circumstances and the distribution of the vessels has been thoughtfully arranged. The larger vessels have been employed on the Amara-Kut ferry where the river channels are comparatively good, while the smaller lighter-draft vessels have been used on the Kut-Baghdad section, where channels are comparatively poor.

129. The system of low river operations to be followed in future will depend on the success that may be attained in the river improvement operations to be undertaken. If the bandalling operations result in the improvement anticipated there will be no necessity to base a part of the fleet on Kut, as through carriage by the Basra based vessels will be possible. It is hoped that the bandalling operations will allow of vessels being loaded to a draft of 5 feet throughout.

Carriage is almost entirely by flotillas of one steamer and two barges, single-handed working being almost unknown.

Comparison with commercial practice.

130. The proportion of mechanically propelled vessels to barges is high as compared with good practice in ordinary commercial working. Appendix A (2) shews the proportions at various dates and the proportion as it will be when all up-river towing ships and all barges are in commission. While the proportion is comparatively high it should be noted that the load is only one way, and barges are not detained for downward loads nor for discharge at downward destination. It should be further noted that the traffic to be carried is practically steady as compared with unsteady seasonable traffic for which commercial concerns have probably to provide, and which, in their case, may be provided for by a larger proportion of barges. If these facts are taken into account the proportion of 1 to 2.84 is reasonable.

131. The movement of vessels other than native craft is controlled by the Deputy Assistant Director of Transport, Basra, and as necessary by the Deputy Director, Inland Water Transport, Baghdad; Deputy Assistant Director of Inland Water Transport, Amara, and Deputy Assistant Director of Inland Water Transport, Kut, in their own areas.

132. Appendix C (5) shews the running time and repair time of the principal self-propelled vessels during September, October and November, 1917. The steaming time is low and the repair time is high as compared with good practice, but in each case there are facts which largely explain the comparatively unfavourable result. In certain sections of the river the channels have been but recently marked and certain sections are difficult to navigate at night. These facts tend to

keep night running low till navigating officers get more familiar with such navigation, and in the result steaming time is low. There have also been considerable detentions at Basra and Amara due to traffic not being available for shipment, and at Basra due to necessity for loading in detail instead of in bulk. This has meant detention to vessels and the consequent comparatively low proportion of steaming time.

133. The comparatively high proportion of repair time is, in part, due to the fact that the workshops at the different centres have been only recently developed, that owing to lack of berthing accommodation at the dockyard, vessels have had to be dealt with away from the yard, and owing to the lack of slipway accommodation under water repair to vessels has had to be done on the hard with all the restrictions resulting from tidal working.

To meet all these difficulties, which have tended to keep the operating value of the fleet comparatively low, every effort is being made to improve channels and keep them well marked, and the dockyard and up-country workshops have been developed into well-organised, well-equipped and efficient establishments where all classes of work will be done in reasonable time.

134. Beyond providing the carrying vessels and controlling their movements, the Inland Water Transport Directorate has little to do with the traffic, and this arrangement is a great departure from the principles underlying commercial working. To ensure that the greatest value may be got out of the space available in carrying vessels, commercial working provides that the technical officers working the fleet should allocate the vessels for the traffic to be carried, should apportion the loads, should arrange loading and should arrange for and control discharge. None of these functions is at present performed by the officers of the carrying concern; that is the Inland Water Transport. They are performed by non-technical staff officers in the Inspector-General of Communications' office, who consult with the Inland Water Transport Directorate in making the arrangements. There must be a considerable loss of efficiency under the arrangement. The maximum carrying efficiency of the service cannot be attained till the present system of detailed loading by the shipper is abandoned, and until the traffic is given in such quantities to the carrier as will allow of systematic loading to get the most out of the available tonnage.

135. The remarks in the preceding paragraph apply most markedly to Basra clearances but the same arrangement is followed at the transshipment stations of Amara, Kut, Hinaidi and Advanced Base (Right bank) and cannot but militate against securing the best possible clearances. The operating officers have in certain cases found the sanctioned arrangement so hampering to their work that they have arranged a compromise which gives more liberty of action to the carrier.

136. The tonnage carried and the mileage run by the fleet shew a steady progression during the past year, which was of course to be expected as a result of the growth of the fleet. Appendix C (6) shows the increase in ton-mileage as compared with the increase in numbers and tonnage of the fleet. The comparative result is reasonably satisfactory, the ton-mileage having risen in the same proportion as the increase in barge tonnage, but in considerably greater proportion than the increase in towing steamers.

137. It is practically impossible to assess the value of the work done in comparison with the carrying capacity of the ships. The results as they stand, in relation to the maximum capacity of the fleet employed, show badly. This, however, is unavoidable where the traffic is only in one direction. Further, the fleet is largely composed of vessels which were designed to give their maximum results under quite different conditions. Steamers which under the conditions they were designed for could efficiently tow 2,000 tons are here employed under such conditions as restrict their tow to a maximum of 800 tons; and others which can efficiently carry a load of approximately 600 are, by the conditions under which they work, restricted to loads of 400 tons. We have been advised by the Director of Inland Water Transport that, with a view to giving these powerful steamers a heavier tow, he was arranging to give them three flats instead of two when necessary.

The loss in working efficiency is further increased by the fact that many of the paddle steamers employed have their wheel immersion designed to give the best result at a draft in excess of the possible working drafts in Mesopotamia.

138. One other difficulty which affects the comparative inefficiency of the fleet, considered in terms of tonnage, was exemplified in the position at Amara when we last visited that station. A large number of barges amounting to approximately 40 were lying at the station, and we were advised that this was, to some extent, due to the fact that the rise in the river had allowed of the steamers carrying bigger loads and there was consequently less for the barges to carry.

139. For the various reasons given in the foregoing paragraphs it is quite impossible to compare the result of the fleet operations with what would be considered reasonable and satisfactory results in commercial working. The fleet is kept in good condition and except for the departure from good practice mentioned above is efficiently worked. Energetic and capable work by the officers up river reduces detentions to a minimum and results in efficient working. Probable improvement in channels with resultant increase in loads, extension of night running as the navigating officers get more accustomed to river navigation, and reduction in repair time should all tend to better results.

Native craft.

140. A large fleet of chartered native craft is employed in assisting the main fleet on the Tigris chiefly between Basra and Amara; they are also used between the two sections of the Advanced Base at Baghdad and in the upper Euphrates section. Appendix C (2) shews the mileage operated by these native craft. Appendix C (4) shews the number and tonnage of the draft employed. It also includes a comparative statement of ton-mileage worked by these craft which gives a fair idea of the very useful auxiliary carrying work done by this fleet.

A number of these draft is being fitted with screw propelling oil driven machinery. The first of the vessels to be fitted has been tried with successful results.

Dockyard.

141. Practically all repair work for the Inland fleet based on Basra, and a considerable amount of work for ocean-going steamers, and construction work is undertaken at the dockyard which has developed into an extensive establishment. The total number of men at present employed being approximately 4,000.

Much progress has been made towards making this a highly efficient establishment. Workshops of efficient type and arrangement have been constructed and are fully employed. Jetties for convenient berthing of vessels under repair have been constructed, basins have been excavated, and ground raised above flood level as necessary. Slipways, capable of taking the largest of the inland steamers, have been constructed. In all directions the establishment is being equipped in a comprehensive and business-like way.

142. The value of all that has been done will be increasingly realised. The fleet has grown to large dimensions and regular extensive and recurring repairs are now necessary. Fitting out work will doubtless decrease, but this will probably be more than balanced by the regular recurring repairs that from now onward will have to be undertaken. Vessels which were new a year ago will now be coming in regularly for considerable overhaul, and the same applies to vessels reconditioned when leaving India or on arrival at Basra. Such being the case the foresight and energy with which the yard has been designed and arranged will give immediate practical result and will ensure the fleet being maintained in such a state of efficiency as reliability requires. A good deal has still to be done, and additions and improvements in various directions are in progress. In relation to the work likely to be thrown on it, the establishment and the expenditure on the dockyard are justifiable and are calculated to ensure efficiency and the most economical utilization of labour.

143. At present the dockyard is working day and night. The personnel is very fully employed, a condition of things which points to probable justifiable extension of both facilities and personnel.

**Re-erection Yard,
Magil.**

144. The erection of steamers and barges from plates and angles, the fitting out of steamers from the United Kingdom and the fitting out of tugs which require boilers and all deck fittings erected is carried out at Magil Re-erection Yard. The yard also does girder work, etc., for the up-river works, makes buoys and bridging pontoons, repairs all motor lighters and steam barges and undertakes repair of any barges which are badly damaged.

The yard is very efficiently organised and suitably equipped. The number of men employed is approximately 3,200. There are 13 building berths available for erection of vessels and during the three months ending December, 1917, 24 barges have been delivered, giving an average construction of 8 per mensem including all vessels, 42 have been completed in the yard during this period, giving an average of 14 per mensem.

These are satisfactory results and particularly so in view of the fact that the yard is a comparatively new establishment, ground having been first broken at the site towards the end of 1916.

145. The facilities for working traffic at Basra and at up-river stations have **Up-river stations.** been gradually extended or are now being carried out. Chapter I, paragraph 12, deals with the progress made in this direction in the Port of Basra. At up-river stations, such work, all of a necessary kind, has been done; wharves and jetties of a suitable kind have been constructed to facilitate the berthing of vessels and the working of traffic. Banks have been revetted and the improved foreshore been made into suitable traffic working areas where necessary. We inspected the more important stations up-river and found the facilities provided were necessary and such as would give increased efficiency in working the fleet and personnel.

Offices and quarters have been erected at all river stations as necessary. The provision of these has entailed a great amount of work and expenditure but they were essential and have been reasonably designed and constructed. Storage tanks, pipe lines and ghat hydrants have been put in or are being provided at stations where oiling of vessels is necessary.

146. Efficient workshops of suitable size and reasonably equipped have been provided at:—

Amara.

Kut.

Nasiriyeh

Baghdad (motor boat slip and workshop).

Feluja (a small workshop in process of fitting out).

A floating workshop for emergency up-river work has also been brought into service and provided invaluable facilities during the advance of last year. It is at present at Baghdad and is worked in conjunction with the main workshop.

The up-river facilities have practically all been provided during 1917, and the expenditure on this account must have been very heavy. The buildings, wharves, jetties, and workshops are either finished and equipped or nearly so, and there is likely to be comparatively little expenditure on account of the above from now onwards if the mileage of the river operated remains as at present.

147. A large number of motor boats is used in general service in operating the **Motor boats.** fleet. Appendix A (5) shews how the total fleet of motor boats is distributed. We invited the Director's attention to the large number of general service boats based on Basra. He stated that this matter had had his attention for some time. A number of pools had been started with the idea of securing economy in use of boats. The scheme first tried had been found unworkable and a single pool which the Director hoped would ultimately become a general pool had been started. The Director advised us that the general pool would undoubtedly effect a great saving.

148. We find a complete system of costing in operation at the dockyard en- **Costing.** tailing much work and the employment of a considerable staff. On enquiring into the necessity for this in the present circumstances in Mesopotamia, we learned that it was started by a previous Director but there was some uncertainty as to why it had been started. As no prices are sent from India with material, the Dockyard Accounts Department fixes the prices on the basis of certain pre-war prices plus a certain percentage. The present Director would not object to costing being stopped and thinks there would be no loss of efficiency, interest or energy in the work done, this might be considered.

Floating bridges.

149. The various floating bridges have been either made or reconditioned by the Inland Water Transport and this work has been practically all done in 1917. The following are the bridges dealt with by the Inland Water Transport :—

Qualat Saleh.
Amara.
Sheikh Saad.
Kut.
Dyala (Mouth).
Dyala (Cassels Post).
Dyala (Baqubah).
Baghdad (South).
Baghdad (North).

The bridge at Amara is a new bridge and was constructed by the Inland Water Transport. All the other bridges were reconditioned; some of them were practically rebuilt. Nearly all this work, also a big floating ramp for the Ordnance Department at Baghdad, has been carried through during the past year and must have entailed heavy but necessary expenditure. The upkeep and working of these bridges is in the hands of the Inland Water Transport.

Stores.

150. The Inland Water Transport Central Store is situated at Magil; the area of the store yard is 22 acres, and the area of covered accommodation (sheds) is 2·04 acres. The staff employed numbers 11 officers and 562 men, 45 of whom are British Royal Engineer ratings.

The average weekly receipts from all sources (taking over a period of 4½ months) amounted to 957 tons.

The average weekly issues of material were :—

	Tons.
General stores	559
Special stores such as filtration plant, hospital ships' gear, river craft park, etc.	356

151. The store yard is served by a deep-water jetty where sea-going vessels discharge if so arranged by the Port Traffic Department. During the period September 17th, 1917, to 25th January 1918 stores were received as follows :—

	From England.	From India.
	Tons.	Tons.
Ships discharging at stores jetty	9,766	3,138
Ships discharging in stream	607	5,609

152. The Deputy Assistant Director, Stores, through the Director, indents for all stores for the Inland Water Transport and the stores, except timber of sizes, are all stored at the Central Stores. From this Central Store all departmental stores in Basra and up-river are supplied. Stores for ships in Basra are issued through a ships officer who is located in the Central Stores, takes delivery of stores for each vessel and arranges distribution to the vessel.

The store accommodation has only recently been completed and final arrangement of stores was still going on. The buildings are suitable, well arranged and well conducted, the whole arrangement being conducive to efficiency.

153. Stocks of stores are not excessive. Indents are based on keeping a reserve equal to three months' issues, but in many important items the stocks held fell far short of this. There may be a few exceptions to this, all, probably, capable of explanation.

154. No opinion based on experience can yet be given on the benefits to be derived from the timber pool agreed to last year. The new arrangement is not yet in thorough working order.

155. We visited all up-country stores and in no case were the stocks unreasonable. Where it has been possible to provide suitable stores the buildings were well arranged and well conducted. The store accommodation at Amara and Nasiriyeh was insufficient and poor but in both cases the matter was already having attention.

156. We have made enquiry as to when the fleet is likely to be fully commissioned and Appendix A (4) shews the vessels still on order in the United Kingdom and gives an estimate of probable date of commissioning. These estimates are the best that can be given, but cannot be relied on. With carrying tonnage short, carrying steamers liable to be sunk and voyages under own steam so uncertain, it is futile to put any faith in any estimate however carefully considered, and the date of completion of the fleet programme must be written down as uncertain. Completion of building programme.

(b) *Railways.*

157. A general description of the Railways has been given in Chapter I of this report and it is now proposed to consider them in greater detail.

158. The southern group consists of a line from Basra to Nasiriyeh on the Euphrates, the general direction being North-West, and a line from Basra to Amara, the general direction being North.

159. The Railway Station for Basra is situated at Makina, about two miles from the river front, the general alignment being parallel to the river. The lines to Nasiriyeh and Amara take out at opposite ends of the station, so that there is a straight run through from Nasiriyeh to Amara. The Locomotive Shops are at Shaiba two stations out (16 miles) on the Nasiriyeh line. Terminal facilities at Makina are still practically non-existent. An engine shed is in course of erection but there are no watering arrangements. Engines have, therefore, still to stable at Magil, where there are service tanks supplied with water pumped direct from the river, but there is no shedding accommodation. The Station Master's office at Makina is a tent, but a building has been sanctioned. There are four loops and five dead-ends for marshalling, together with troop and other special service sidings.

160. The line to Nasiriyeh is laid on the desert on a location which is believed to be above the flood level of the Euphrates. The gradients therefore are the natural gradients of the desert surface, and in places are steeper than would have been allowed, had the line been surveyed in the first instance and properly graded. Most of these steep gradients can, however, be treated as momentum grades, and, moreover, arrangements are in hand to improve them. There is only one watering station between Basra (Magil) and Nasiriyeh, namely, Ghubashiyeh, where water is brought by an open cut from the Euphrates; engines therefore have a special tank wagon behind the tender. The station arrangements at Nasiriyeh, though far from elaborate, appear to be sufficient for existing traffic.

161. The line is worked on the telegraphic line clear system and the following wires are supplied for railway use: One train wire and one through wire with offices at Makina, Shaiba, Retawi, Luqait, Telallaam and Nasiriyeh. There is only a very light traffic on this line at present.

162. The line from Makina to Amara is much busier and is in fact being worked up to its present capacity, taking into consideration its physical condition and the number of locomotives available. There are no gradients to speak of, but train loads are limited by the lengths of sidings and the want of proper watering arrangements resulting in frequent engine failures.

163. The source of water-supply is the river Tigris, which carries an enormous amount of silt, and it is therefore essential that the water should pass through settling tanks before being used in locomotives, but hitherto these have not been provided, though their construction is in hand. The result of using this water is very apparent in the condition of the locomotives. The provision of adequate water-supply and the lengthening of sidings is being taken in hand.

164. At Amara there is no engine shed and practically no equipment for undertaking running repairs. Supplies and material are here transferred to the river for conveyance to Kut and for this purpose sidings have been laid down to the river. The lay-out leaves, however, much to be desired and a remodelling scheme is under consideration.

165. This bad lay-out at terminal and transshipment points on the river is almost universal. The railways have perforce to run down to those points on the river where good water exists and steamers and barges can lie alongside. The river services being first in the field, these water fronts had naturally been occupied not only by the Inland Water Transport repair workshops, stores and offices, but also by other services, partly to be near the transportation facilities, but also because the bank of the river is generally the only high ground available for building without raising the site. When the railway came along, such building as it was not absolutely necessary to retain on the river front should have been ruthlessly swept away in the interests of transportation generally, but instead of this course being followed, the Railway Administration had to make the best use possible of unoccupied ground even being compelled to put in very sharp curvature to avoid buildings of no significance whatever. Instances have been brought to our notice where the railway officers had difficulties even in getting tents moved away from the railway alignment.

166. The Basra-Amara section is also worked on the telegraphic line clear system, train following being allowed in daylight. Two wires have been provided, a train wire and a through wire with offices at Makina, Nahr Umr, Qurna, Qualet Saleh and Amara.

167. An obstacle to economical working on this length is the pontoon bridge over the Euphrates at Gurmat Ali. Heavy engines are only allowed over this bridge with very special precautions, and it is intended to work the section Makina-Nahr Umr with a shuttle service with "F" class engines. As already explained in Chapter I, a good deal of the traffic on the Amara section will originate at Nahr Umr, where a certain proportion of ocean-going vessels will discharge, so long as the Tigris route is the main through route to Baghdad, and the wagons brought by the shuttle service from Makina and those loaded at Nahr Umr will be marshalled at this place into train loads for conveyance to Amara. At present both "F" class and heavy engines ("R" class) are used on this length, but the intention is to use only "R" class engines on the whole of the Southern group with the exception of the shuttle services above mentioned.

168. The railway line from Kut to Hinaidi also carries a heavy traffic and is being worked up to its present capacity. The lay-out at Kut is not so cramped as at Amara and transshipment facilities are efficient. There is a small shop fairly well equipped with machinery and a running shed to hold 4 engines is under construction. Watering arrangements are satisfactory at Kut, but are still incomplete at intermediate watering stations and at the terminus of this engine run, viz., Hinaidi. The line is worked on the telegraphic line clear system, train following being permitted in daylight. There is a train wire and a through wire with offices at Kut, Imam Mahdi, Shadhaif, Aziziyeh, Zeur, Bustan and Hinaidi.

169. From Hinaidi a metre-gauge line runs to Baqubah on the Diala river; this line is similar in character to the Kut-Hinaidi line. It is worked on the telegraphic line clear system, with one through wire for the 5 stations on this length. A train wire has been asked for.

170. At Baqubah material and supplies are transhipped to the 2' 6" gauge which runs on to Table Mountain. There is no engine shed accommodation at present for the engines of this gauge, and the repair shop is of the most primitive description, the few machines in the possession of the Locomotive Department at this place relying on tarpaulins stretched on bamboos for their protection and that of the workmen against the weather. It is obvious that work can be neither efficiently nor expeditiously carried out in such conditions. The permanent way material on this line has already been laid and picked up several times and has therefore somewhat deteriorated but nevertheless this line carries a daily traffic of about 500 tons. Train working is done by telephone, there being 6 stations on the circuit.

171. The line from Baghdad (right bank) to Samarra (4' 8½" gauge) was built by the Germans under peace conditions and is or was a well-found railway in every respect with properly graded banks and bridges. A good deal of damage was done to works, such as blowing up of bridges, high service tanks, station buildings and engine sheds and a very determined effort was made to destroy all the engines, but fortunately it was found possible to put some into commission after a short time.

This line is worked on the telegraphic line clear system with a train wire and through wire with offices at Baghdad, Beled and Samarra. A short branch has been built during the last 6 months from Samaichar to Sadiya on the Tigris.

172. A line on the same gauge (4' 8½") has been constructed to Feluja on the Euphrates ; it takes out at the opposite end of Baghdad station from the Samarra line, thus making a through run Samarra-Baghdad-Feluja. There is a fairly well equipped round-house at Baghdad, and in addition a small workshop moderately equipped, but with the new mileage to be added on this gauge, extensions to shops and more machinery will become necessary.

173. At Shaiba are the main shops for erecting and repairing locomotives and Shops. rolling stock for the metre-gauge lines. They are much too small for the mileage already constructed, and are but poorly supplied with machinery and equipment ; for instance, they are still without an overhead crane in the erecting shops ; and there are no pits ; locomotives under repair have, therefore, to be packed up on to wooden blocks. The question of shops and running shed arrangements has been dealt with more fully in Appendix G (5).

174. The main stores for the railway system are also located at Shaiba along-Side the loco shops ; they seem fairly well supplied with shedding accommodation, though doubtless more could be utilised if it were available.

175. The stocks held are by no means excessive ; in fact, considering the long time that must elapse between demands for, and receipts of, supplies for normal consumption, and the fact that it is impossible to foresee requirements to meet military demands for extensions, we are of opinion that the stocks held might be increased. There are also depôts at Kut and Baghdad, and at both places the stocks held are none too large. Railway Stores have often been short of material and have applied to the other Directorates for assistance, which has been afforded whenever possible.

176. The economical operation of the railways has so far depended mainly on the question of providing locomotive power. The use of muddy water and the inadequate facilities for washing out and doing the necessary running repairs to engines have resulted in many engine failures, reductions in loads of trains and a progressive deterioration of the engines themselves. Owing to the inadequate size of the shops at Shaiba it has not been possible to take in the proper proportion of engines for heavy repairs, and, owing to the wretched equipment, engines in shops cannot be turned out as quickly as they otherwise would be. The traffic has also grown to such proportions that it has not been possible to stop engines which badly need general repairs, as there are not enough engines on the line to take their places, and such engines have, therefore, to continue running till they fail by the wayside. The engine position is, therefore, a very critical one and is daily becoming worse, and if the additional engines under orders from India do not arrive before the " lame ducks " now running have to be withdrawn from traffic, the amount of daily tonnage expected from the railway will have to be reduced.

177. In these circumstances economical operation is not possible, though in other directions conditions are most favourable. Practically all loads are through loads, traffic for intermediate stations being merely supplies and amounting to a negligible quantity compared with the total carried ; also wagons are always loaded as full as they will carry and the turn round of stock is excellent, wagons often doing a round trip between Basra and Amara in 24 hours and between Kut and Hinaidi in 36 hours.

When the engine position has been improved and certain sidings lengthened to enable longer trains to be hauled the operating efficiency of the railways should be a high one.

178. It will be seen that except for two short lengths that are worked by telephone the system of operation is that of telegraphic line clear. The difficulty of obtaining signallers to work even the existing mileage is very great, and it is considered advisable to adopt some other system, so as to release signallers for dealing with other railway business and with the ordinary telegraphic work of the country which is very heavy indeed owing to the long time it takes to get replies to letters.

179. We have carefully considered this matter and are not in favour of the introduction of Neal's or any other token instruments which require special knowledge to make occasional adjustments, and would require a travelling staff to keep the machines in repair. We recommend the extension of telephonic line clear working to the less busy lines, and that those carrying a heavy traffic should be worked on the simple line clear system known as "train staff and ticket" coupled with telephonic train control. By this means not only will signallers be released, but the capacity of the busy sections will be greatly increased.

180. The two sections which should be worked on this system at present are the Makina-Amara and the Kut-Hinaidi. It is understood there are already 3 trunk telephone lines between Basra and Nahr Umr and a trunk line is under construction between Basra and Amara. This section could probably be worked with one trunk line divided into 4 circuits, with controllers at Nahr Umr and Qualet Saleh each working a circuit North and South of them. The Kut-Hinaidi line might be worked with a controller stationed at Aziziyeh, but he would have 8 stations on his northern circuit and 7 on his southern and this might prove to be too many.

181. The recommendations made above would release a large number of signallers from unimportant stations. The offices on the through wire would remain, and it might be necessary to increase their number, especially on the Baghdad-Samarra section where there is only one intermediate office, namely, at Beled. It is not considered that there would be any difficulty in communicating with the stations that will have no telegraph office. Their messages would be sent by train to or from the nearest office on the through wire.

182. Finally we are of opinion that it would be of great assistance to the Director in administering the widely separated railway system if two fast launches were placed at his disposal to maintain a daily daylight service between Amara and Kut in each direction. Such a service could no doubt also be used by high officers of other services at the discretion of the Director, and for important correspondence of all services, and we recommend that this should be done.

(c) *Comparative expenditure in Personnel and Fuel.*

INLAND WATER TRANSPORT AND RAILWAYS.

183. *Inland Water Transport.*

Railways.

<i>Fuel.</i>		<i>Tons.</i>	<i>Fuel.</i>	<i>Tons.</i>
Coal	.. ..	47,250	Coal	.. .. 13,526
Fuel, Oil	.. ..	17,012		in 12 weeks.

Total Fuel .. 64,262
in 3 months

or 700 tons a day.

or 161 tons a day.

Personnel.

Personnel.

	<i>Europeans.</i>	<i>Natives.</i>	
Afloat	893	.. 10,925	Employed, as per sanctioned establishment on 20th November 1917.
Ashore	3,188	.. 23,706	

on 8th December 1917 (excluding crews of chartered vessels and country craft and excluding attached labour on shore— 8,415)

Total Personnel .. = 38,712

=16,227

Inland Water Transport.

Ton-Mileage.

Total in 3 months = 75,598,268
 Deduct ton-mileage of native craft miles
 at 300 tons a day average for 132
 miles between Basra and Amara = 3,643,200.

Also deduct ton-mileage of chartered
 vessels at 550,000 a month or
 total = 1,650,000

Ton-mileage for comparison = 68,305,068
 in 3
 months.

or per day .. = 742,446

Therefore I. W. T. work

$\frac{742,446}{700} = 1060.6$ ton miles

per ton of fuel expended
 and

$\frac{742,446}{38,712} = 19.2$ ton miles

per man employed per day.

Railways

Ton-Mileage.

Total for 12 weeks, taking into
 consideration "loaded"
 direction only = 26,319,479

or per day 313,327

and Railways work

$\frac{313,327}{161} = 1,946$ ton miles

per ton of fuel expended
 and

$\frac{313,327}{16,227} = 19.3$ ton miles

per man employed per day.

It may be explained that although in civil practice the comparative cost of operating river and railway transport will undoubtedly be in favour of the former, the low draft of the river Tigris is the cause of an opposite result in this country.

If the endeavours to deepen the draft of the river by bandalling are successful, it is probable that a ton-mileage equal to that now worked will be obtained with an expenditure of 25 per cent. less fuel.

(d) Port Traffic in Mesopotamia.

184. During the year 1916 a Directorate was formed at Basra under the title of "*Port Administration and River Conservancy.*"

This department was charged with responsibility for:—

(i) The discharge of ocean transports to quay or port craft and the conveyance of port craft so loaded to quay.

(ii) The construction and maintenance of port works.

(iii) River Conservancy from Gurmat Ali in the north to the sea.

(iv) The control of movements of ships and kindred matters within the area specified in (iii) above.

185. The head of this department was Sir George Buchanan, but this officer returned to India shortly after the formation of the directorate.

Since that time it has ceased to operate as a whole, and responsibility for its various functions has been divided as follows:—

(i) Under the D. I. W. T.

Discharge of ocean transport to quay.

Discharge of ocean transports to barge.

Berthing alongside quays of barges loaded *ex* transports.

Checking of supplies *ex* transports and barges.

(ii) Under the I. G. C.

Port Construction and River Conservancy.

Port Officer and Pilots.

186. In order to carry out the duties enumerated in paragraph 185 (i) above, the post of Assistant Director, Port Traffic, was created. This officer is under the orders of, and responsible to, the Director of Inland Water Transport.

The duties devolving upon the Assistant Director, Port Traffic, are simply those of discharging cargo from vessels to quay direct and the conveyance of loaded barges to the quays. The actual handling of cargo *ex* ship or barge berthed alongside the quay is carried out by the consignee services concerned.

187. At present vessels are discharged in the stream to barges, and direct to quay against Magil river front and at Nahr Umr—20 miles up the river.

There are practically no shore cranes or mechanical appliances in use.

During the month of November cargo was distributed from ships in the following manner :—

60 per cent. to barges.

40 per cent. at quay berths.

The average rate of discharge attained was about 300 tons a day.

188. It is now proposed to appoint a *Port Director* who will assume full responsibility for Port Traffic, Port Construction and River Conservancy within the port limits, and under whom the Port Officer and Harbour Masters will be placed.

The responsibilities of the Port Department will be extended so as to include not only stevedoring but delivery from either ocean transport or barge on to the quays into specially reserved areas, of approximately 1,000 feet in depth from the river front.

189. Whereas at the present time the port is worked upon a system by which various departments have special berths allotted for their use and, in addition, hold quantities of supplies on and close to the river front, a port railway system will be introduced in order to convey the cargo discharged at once away from the quay front, so that congestion will not occur and vessels can make full use of the berth without being hampered in their discharge by the presence on the quayside of cargo discharged from the vessel previously occupying the berth.

It has also been decided that not only will the areas behind the wharves be in the charge of the Port Department, but the railway operations within the port area will also be under its direction.

190. A definite programme of wharf construction and railway lay-out is decided upon and it will be necessary that cranes, chutes and conveyors should be obtained as quickly as possible. When these are provided, it is intended that vessels should discharge to shore by shore appliances and to barge on the off-side by ship's gear, the barges so loaded being brought afterwards to barge off-loading wharves for delivery to consignees.

191. A great deal of confusion and delay seems to have arisen in the past owing to the operation of discharging ships, discharging barges and loading barges being all carried out on a narrow and limited frontage.

To meet this situation a system of barge-loading wharves, separate from barge discharging wharves, will be constructed, and arrangements will be made to discharge vessels containing cargo for despatch up river at a point where the cargo so discharged need not enter the main dock system.

The average rate of discharge at present, as has been stated above, is about 300 tons per day. By equipping the wharves, clearing the spaces behind and giving special consideration to the discharge of ships, it is thought that the rate of discharge should be at least doubled.

CHAPTER IV.

COMMERCIAL TRAFFIC.

192. The Inland Water Transport carries no commercial traffic at all.

The railways carry a little on the southern section (Nasiriyeh-Basra-Amara). Passengers only in small numbers are carried between Basra and Amara and both

passengers and goods between Basra and Nasiriyeh. The latter amounts on the average to about 5 wagons daily, sometimes more, sometimes less, as military requirements permit. It consists in the up direction (to Nasiriyeh) chiefly of food grains and other necessities of life for the large towns on or near the Euphrates, *e.g.*, Kerbela, to which it is carried on from Nasiriyeh either in country craft or by caravan across the desert. In the down direction there is no "paying" traffic. Sheep and goats belonging to Arab merchants are carried, but these are for consumption by the Army and are taken over on arrival at Basra at prices prevailing at Nasiriyeh, both owner and live stock being carried on a free pass. See Appendix G. (2).

Traffic in live stock is also carried between Baquba and Baghdad.

As regards this traffic it may be mentioned that Nasiriyeh and Baquba are both places where sheep and goats are available in large numbers and they cannot be marched to Basra or Baghdad respectively because neither grazing nor water is available *en route*. That the permission to utilize the railway for commercial traffic is appreciated is shown by the keen competition that takes place for the 5 wagons from Basra to Nasiriyeh.

193. There is no doubt that the use of the railway for the public carriage of passengers and goods is a great influence for good in pacifying and settling the country, and we are of opinion that as facilities improve and opportunities offer this should be gradually developed.

In view of the almost negligible proportion which this class of traffic bears to military traffic, it certainly cannot be said that commercial traffic is carried to an undue extent.

6. JOINT WORKSHOPS.

194. After visiting the port of Basra and up-river stations and with the knowledge obtained of the considerable areas these occupy, we have no hesitation in stating that a joint system of workshops would be impracticable. No economy in personnel or material would be obtained.

In Basra the Inland Water Transport require their workshops near the dockyard, which is not connected with the railway nor easily accessible; the same holds true as regards their present re-erection yard to a lesser degree.

The railway workshops are situated at Shaiba, 16 miles away from the dockyard or the R. E. Field Park, Basra; the latter is some distance from the dockyard.

Approximately the same conditions exist at all up-river stations.

195. Any joint system of workshops would necessitate control by an officer capable of deciding priority of requirements and could not be conveniently sited for these three Directorates so that delay in meeting demands would be entailed and additional transport would be required. The same difficulties apply in the establishment of joint foundries. Work in existing foundries is now carried out from rough sketches amplified by verbal instructions, and if foundries were centralized it would mean preparation of working drawings which would have to be made by each indenting officer, necessary drafting staff for which does not exist.

196. In respect of the manufacture of a commodity in common use by all Directorates and requiring to be distributed from definite centres, centralization might in some instances be advantageous. Thus one Directorate would arrange to undertake the manufacture of bricks for the use of all Directorates; this we understand is being arranged for in the Baghdad area and we recommend it be extended if possible.

7. GENERAL STORES.

197. The following Directorates indent on India for stores :—

Ordnance.

Works.

Inland Water Transport.

Railways.

Port Administration and Conservancy.

Present system
of indenting for
Stores.

Unless special instructions are received to the contrary, India deals with indents in rotation. There is no Priority Officer in Mesopotamia, and it is difficult for India to know which indents or items of an indent should receive priority of supply.

198. There appears to be a want of liaison between Mesopotamia and India.

It is not known in Mesopotamia, for a considerable time after indents are submitted, that a particular article cannot be obtained in India; also no advice is forwarded to Mesopotamia showing probable date of despatch of such material as can be supplied.

This is a very serious defect, and we are of opinion that India should keep Mesopotamia regularly informed of the progress made in complying with indents.

General Stores.

199. We have considered the possibility of establishing a General Store for all Directorates and are satisfied that it is only possible in the case of the Transportation Services, *i.e.*, Inland Water Transport, Railways and Port, and then only provided that a technical transportation head is appointed, as has recently been recommended. (See Chapter II.)

We exclude Works and Ordnance because it would be most difficult to decide priority of issue in the absence of one co-ordinating authority over these two Services and also over the three Transportation Directorates above mentioned; because it would mean a considerable dislocation of work, resulting in delay and confusion during the transition stage, and would necessitate taking up much ground and extensive erection of sheds for storing material.

Further, ordnance stores are mostly "Vocabulary Stores", which have been standardised and in our opinion do not meet the needs of other Directorates.

200. There appears to us to be no good reason why arrangements for a General Store for the Transportation Services under a single controlling officer should not be set in train as soon as the appointment of a technical transportation head has been agreed to. The existing Inland Water Transport Store is conveniently situated and could be expanded as required, and we recommend it should be the central *dépôt* from which Inland Water Transport, Railways and Port could be supplied.

If these proposals are accepted, instead of five different Directorates submitting indents to India, there will be three, *viz.*:—

Ordnance.

Works.

Transportation.

Coal, timber and oil.

201. Arrangements have already been made to pool all receipts of coal, timber (of sizes) and oil, and to issue to all Directorates from a common stock.

8.—UTILIZATION OF OIL FUEL.

(a) *Inland Water Transport.*

202. This important matter is receiving special attention and a large scheme of conversion is in hand. Appendix A (3) shews the position at the beginning of 1918 and the number of conversions to be undertaken.

The conversion to oil fuel of the 45 vessels specified will effect a reduction in coal consumption of approximately 1,440 tons weekly. The conversion of these 45 vessels is not expected to be completed before the end of 1918.

(b) *Railways.*

203. Utilisation of oil fuel for locomotives on Mesopotamian railways has been carefully considered and there appear to be no reasons why the conversion should not be carried out in due course; in fact, steps have already been taken by the Director of Railways to arrange for the oil fuel installation and manufacture of the necessary locomotive fittings for conversion has been begun.

204. It is, however, essential that before locomotives are actually converted the detailed supply to them of oil fuel should be assured.

At the present time the Inland Water Transport are undertaking the installation of oil tanks at Amara, Kut and Hinaidi, but the work has been delayed in consequence of the proposal now under consideration to construct a through railway *viâ* the Euphrates route.

205. A very large amount of extra work will be thrown on the workshops, which are already insufficiently equipped with machinery and plant to deal with heavy repairs to locomotives, and it is feared that the work of conversion will not progress as rapidly as is desirable. Also due to the shortage of locomotive power it will be impossible to withdraw engines from traffic to convert them to burn oil fuel, and this can only be done as engines come into the workshops for heavy repairs.

206. The assistance from India of men experienced in fitting engines to burn oil and in running them has been asked for, and steps should be taken to meet this demand as soon as possible. Probably a large number of travelling oil tanks will also be required from India, and as soon as it is known what classes of engines will be supplied to meet demands now outstanding, India will be asked to construct tender oil tanks for them.

It is desirable that every assistance should be given to Mesopotamia in this connection, as the position as regards supply of coal is by no means satisfactory. Stocks in Mesopotamia are low, how low can only be gauged by the fact that the Director of Railways has to submit statements showing his requirements of coal for a week at a time, whereas stocks at each shed should be sufficient for at least three months' consumption.

CHAPTER V.

FUTURE DEVELOPMENT.

207. It is essential in war time that the railway Directorate should be in a position to carry out surveys and construction work rapidly and at short notice, and should be prepared to operate the railways so constructed for a heavy traffic as soon as completed, or in many cases before construction has been fully completed. Modern Armies depend almost entirely for their mobility on railways or rivers, and their radius of action is limited by their power to operate, construct and repair railways, or carry out equivalent services on the rivers behind them. General.

If forces can be moved rapidly from one point to another, it may be possible to avert disaster, which would otherwise be inevitable or, on the other hand, to strike blows at the enemy for which he is unprepared. As an instance of the former may be quoted the situation in Mesopotamia itself when, during the operations for the relief of Kut, large forces were at Basra and could not be moved up to the scene of action for want of proper transportation facilities.

208. It is therefore necessary at all times to have with an Army in the field an adequate reserve of both operating and constructing troops and material for the transportation services. This reserve should not be limited by the actual services or works authorised, because as soon as these services or works have been carried out the reserve will have been absorbed; but as each additional service is authorised the aim should be to modify the reserves correspondingly, so that the Transportation Directorate may at any moment have adequate means ready to hand and not hamper the movement of the Army by inability to do what is asked of them.

209. It is not possible in many cases to foresee with any certainty all the possible developments which may become necessary; moreover, the relative importance of these developments themselves change as the military situation alters.

It has been thought advisable, however, to show what are the more probable directions in which such developments may be expected so as to give some idea of their scope.

210. Taking the question of railways first, the two most important railway extensions at the moment appear to be the line from Baghdad to Hilla on the Euphrates, and the provision of a through railway from Basra to Baghdad. Railways.

211. The Baghdad-Hilla line is an amplification of the earlier Baghdad-Museyib scheme, and its object is to tap the areas now being developed to produce the needs of the army as far as possible from local resources. Under this scheme it is hoped

to provide 240,000 tons of agricultural produce, mainly bhoosa and barley, during the coming harvest. It is impossible to exaggerate the importance of this scheme from the transportation point of view; the help which will be rendered both to railways and rivers in Mesopotamia is very material and when it is remembered that nearly a quarter of the ships discharging at Basra carry fodder and grain for animals in the field, it will be seen that the prospective relief to the vital question of shipping is much in excess of that shewn by the mere statement of dead-weight tonnages. Finally very substantial relief will be rendered to the economic situation in India, more especially as affecting railways.

It is therefore urged that every assistance should be afforded to make this scheme successful and if possible to extend its scope in subsequent years; for further details see Appendix J.

212. The alteration of the terminus of this line from Muscayib to Hilla has been made because 5-6ths of the tonnage will be produced in the area round Hilla, and, as most of the difficulties in connection with the schemes will be those of collection and transport, it is important that the railway should be in as easy reach as possible of the collecting centres.

213. As it is important that the scheme should be completed by harvest time, it is proposed to construct the branch on the standard gauge, and it has been decided not to wait until a decision has been arrived at on the question of the through route between Basra and Baghdad. The permanent-way material and rolling stock for this line are already in the country or under order, and we consider the decision to be a sound one. It will probably be found necessary subsequently to build small feeder lines to tap outlying areas, but the necessity and gauge of these must necessarily depend largely on the question of the location of the through railway.

214. The matter of the through railway connection between Basra and Baghdad is now the subject of discussion between the War Office, the Government of India, and the General Officer Commander-in-Chief, Mesopotamia Expeditionary Force, and Major-General Freeland, and, as we understand the various factors governing the situation have been explained at some length in these communications, it would hardly appear necessary for us to detail arguments which have already been put forward and are known to the Government of India.

215. It would, however, be advisable to point out that whether the through railway follows the Tigris or Euphrates route, some increase in staff and a large increase in equipment and rolling stock will be required if an adequate service by rail is to be assured.

If the policy of a through line is not persevered in for the time being and it is decided instead to strengthen the existing railways up to a higher standard of operation, this again will entail an increase in rolling stock and other equipment.

216. A third scheme, which is now in contemplation, and which we understand will probably be sanctioned as soon as material is available, is the conversion of the existing 2'6" line between Baqabah and Shahraban to metre gauge. Owing to the lack of sufficient metre gauge permanent-way material and rolling stock in the past, it has been necessary on more than one occasion to lay this 2'6" track to feed outlying portions of the force, this track being eventually replaced by metre gauge. This method, entailing as it does practically double construction work, is very uneconomical in every respect, but the authorities have been compelled to adopt it owing, as stated above, to want of metre gauge material. In fact, owing to the number of times it has had to be lifted and re-laid the track is rapidly deteriorating; the rolling stock also is becoming worn out.

217. Further we are informed that reconnaissance parties are now at work for an extension of the Shahraban line to Qizil Rubat and possibly further with the ultimate object of stopping the ingress as far as possible of hostile agents who may try to invade Persia and Afghanistan and stir up disaffection in those parts. If by the time the 2'6" track between Baqabah and Shahraban has been replaced, no metre gauge material is available, which is not already required for more urgent and important lines, the military authorities may be compelled to use this 2'6" track for the extension.

218. Another important project which is under review at the present moment is the possible extension of the Baghdad-Samarra standard gauge line in the direction of Tekrit. As far as Samarra this line runs on the low-lying ground adjacent to the right bank of the Tigris necessitating high embankments to protect the line in case of floods ; near Samarra, however, this low-lying ground narrows to a strip of about 1,500 yards ; outside and to the west of this lies a strip of broken ground about 1,000 yards broad which is bounded on the side furthest from the river by a plateau. It should not entail any heavy amount of work in development to reach this plateau and once there, no danger from floods need be anticipated and an easy alignment appears feasible as far as Tekrit. A survey of the alignment from Samarra to Tekrit is about to be undertaken. The construction of this line is, of course, dependent on the policy to be adopted in the future, but the actual construction work necessitated to reach the plateau can be carried out in the present situation of the force, and so render all the more easy the subsequent extension of the line towards Tekrit if a forward policy is adopted.

219. Amongst minor projects which have been already sanctioned or are in progress, are the extension of the Baghdad-Feluja 4' 8½" line to Dhibban, a distance of 10 miles, and the building of a metre gauge line from Basra to certain quarries, 23 miles distant.

220. Next in importance to the above developments comes the question of reserve of track to be held to meet an advance or unforeseen contingencies.

The Commander-in-Chief has decided that it is necessary to hold a stock of 50 miles of standard and 50 miles of metre gauge track in reserve.

221. Behind all these in point of priority are certain deferred projects which have been put forward at various times but whose importance at the present moment is not considered such as to justify surveys being made.

These include a construction of a line from Mohammerah to Ahwaz, of feeder lines up from the Tigris towards the Pusht-i-Kuh Hills, with a similar object to that of the extension beyond Qizil-Robat and of a line from Basra to Abadan.

The last named has been put forward with a view to avoiding the necessity of bringing oil ships up to Basra ; an alternative scheme which at present appears to be more in favour is to lay the pipe-line from Abadan to Basra and so avoid rail haulage altogether.

222. From the above list of actual works which, with the exception of the three last, may all be considered as within the range of probability, it will be seen that the detention of an adequate reserve of staff, equipment and material actually in the country is a necessity if the demands of the Army are to be promptly complied with.

223. The future development of river transport on the Tigris appears to depend to some extent on the capacity of the narrows to carry an increasing amount of traffic. The difficulties of navigation in the narrows necessitating the tying up of ships to allow others to pass them, restrict the number of vessels which can be passed through, and in this respect may be likened to a section of single-line railway in the middle of a double-track system. Inland Water Transport.

Although the limit of capacity of the river may not yet be in view, there appear to be other good reasons why it is more advisable to develop the railway than to recommend a scheme for the further extension of river transport. For example the heavier comparative expenditure of fuel by vessels, shown in paragraph 183, appears to point to the desirability of future necessary development being by rail rather than by river. Besides this railway working can be expanded to meet sudden rushes of traffic with greater ease than with inland water transport.

Any forward moves also beyond the present position would necessarily have to be supplied by rail.

224. There are two directions, however, in which development may be expected in the near future : —

(i) In connection with the scheme for developing local resources in the Euphrates valley (see Appendix J) and

- (ii) In connection with results which are hoped for in consequence of bandalling on the Tigris.

225. As regards (1) the main difficulty in connection with this important scheme is that of transporting the produce to the railway from the various small collecting centres to which it is brought by the cultivators. This transport work has to be carried out by light van, camels, or light-draft boats, and as the area to be covered is extensive it is anticipated that all these methods will have to be adopted during the coming harvest in order to gain the full benefit of the scheme.

Water transport is particularly well suited for this work as the country is intersected by a large number of canals which are navigable by light draft boats, and there appears to be no doubt that for this reason the success of the scheme will largely depend on what assistance can be given by the Inland Water Transport.

In addition to the light-draft tugs, and barges already earmarked for the purpose a large quantity of native craft will have to be employed. About 60 of these are now being fitted with petrol motors and would appear to be particularly suitable, but this will only represent a small portion of the total number which will ultimately be required.

226. As regards (ii) a good deal of bandalling work has already been done and more will be carried out as soon as the river starts to fall. As already stated, it is hoped that by this means the depth of the channel can be increased during the low-water season so as to give a five feet draft.

Owing to the vagaries of the river and the absence of any long-standing records, no certainty can be held out of obtaining this result. But any results obtained would be so large compared with the labour and cost entailed that every effort should be made to render all the assistance possible in this matter.

As an example it may be pointed out that the average draft of an empty barge is 1' 6", so that if it were possible to obtain a five-feet draft as compared with the limit of 4' 0", its capacity would be increased in the proportion of 7 : 5, and this increase would be gained without any increase in crews or staff beyond that employed on the bandalling.

Similarly, in the case of barges loaded with light cargo, such as firewood, navigation would be made easier and delays would be thus cut down.

CHAPTER VI.

CONCLUSIONS AND RECOMMENDATIONS.

227. We have made several recommendations in Chapters II and IV of this report: a reference is invited to the paragraphs in which we have expressed the following opinions:—

- (1) An officer with technical experience should be appointed Deputy Inspector-General of Communications and should eventually have independent control of all the Transportation Directorates (*viz.* Inland Water Transport, Railways and Port), with the title of Director General of Transportation (paragraph 54).
- (2) The railway personnel should be reorganised on the Divisional Plan (paragraph 66).
- (3) Non-technical officers, non-commissioned officers and men should be taken from the fighting troops and administrative services to supervise daily labour employed on earthwork and other railway works (paragraph 71);
- (4) Railway officers and subordinates should be combed out as required from the fighting troops and from the Inland Water Transport and other services and placed at the disposal of the Director of Railways (paragraph 72).
- (5) Housing and messing arrangements for Indian labour on railways should be improved and particular attention should be given to the special treatment of Bengalis and South Indians (paragraphs 74, 84 and 85).
- (6) More care should be exercised in carrying out the trade-tests of skilled labourers recruited in India (paragraph 76).

- (7) The requirements of Mesopotamia as regards competent skilled workmen should be brought frequently to the notice of all employers in India (paragraph 77).
- (8) Pressure should be brought to bear on Europeans who are reluctant to volunteer for railway services overseas (paragraph 78).
- (9) All employes who volunteer for the duration of the war from Indian Railways should be promised special promotion if they rejoin with clean records (paragraph 79).
- (10) The Superintendent of Recruitment should visit Mesopotamia and certain other measures should be taken to surmount labour difficulties in Mesopotamia (paragraphs 82, 85, 86 and 87).
- (11) European establishment in the Inland Water Transport should be closely scrutinized with a view to the substitution of Indians for Europeans in certain posts (paragraphs 99, 109).
- (12) Sea-going Marine Ratings at present in Mesopotamia should be returned to India and more active steps taken to prevent their recruitment (paragraphs 104 and 105).
- (13) Certificated ratings should, in every case have copies of their certificates (paragraph 108).
- (14) Certain sections of the railway should be worked by telephones and the busy sections should be controlled by telephones and worked on the Train Staff and Ticket system (paragraph 179).
- (15) Two fast launches should be placed at the disposal of the Director of Railways to run between Kut and Amara (paragraph 182).
- (16) India should keep Mesopotamia regularly informed of the progress made in complying with indents (paragraph 198).
- (17) A general store should be established at Basra for all Transportation Services (paragraph 199).

228. Subject to the recommendations just recapitulated our answer to the questions in our terms of reference are as follows :—

Question (i).—Are the Railway and Inland Water Transport Directorates in Mesopotamia organised and administered on systems which ensure the most economical utilisation of the labour—both skilled and unskilled—supplied to them, consistent with efficiency and military considerations? If not, what changes in organisation and administration are recommended?

*Answer (1).—*We recommend a change in Administration, viz., the appointment of an officer with technical Transportation experience to a position in which he can co-ordinate the work of the Inland Water Transport, Railway and Port Directorates and thus ensure the most economical utilization of labour.

We also recommend a change in the organisation of the Mesopotamian Railways, viz., the substitution of a purely Divisional Plan in the place of the present organisation.

Question (ii).—Is Mesopotamia receiving its due share of personnel consistent with the claims of railways, shipping, and manufacturing interests in India?

*Answer (2).—*We have assumed that “the claims of railways, shipping and manufacturing interests” means “such of the railway, shipping and manufacturing interests as are essential to the proper prosecution of the war,” and the claims of Mesopotamia and other theatres of war have priority over all other claims.

With regard to numbers, Mesopotamia has no ground for complaint. India is doing its best to supply in full the demands of Mesopotamia; but the *quality* of some categories of personnel can be improved.

Question (iii).—Is the organisation of Railways and Inland Water Transport in Mesopotamia such as to ensure that : —

- (a) Excessive stocks of materials are not held.
- (b) Demands from the various Directorates are co-ordinated.
- (c) Machinery and tools and plant in workshops and elsewhere are utilized to the maximum extent.

*Answer (3).—*The answer to this question is in the negative. The present organization does not *ensure* the elimination of excessive stocks of materials or the co-ordination of demands from the various Directorates or the utilization to the maximum extent of machinery and tools and plant.

We would mention that excessive stocks of materials are not held at present by the Transportation Directorates and that all machinery and plant is at present being fully utilized.

We are, however, of the opinion that the absence of a Technical Co-ordinating authority over the two Transportation Directorates has rendered it difficult to withdraw from the Inland Water Transport machinery and plant to supplement that in the railway workshops and so obtain a better joint result.

The difference in equipment between the Inland Water Transport and Railway shops is everywhere most marked ; one of the features of all railway workshops being the lamentable want of equipment.

We have the honour to be,

Sir,

Your most obedient servants,

(Sd.) H. F. E. FREELAND, MAJOR-GENERAL.

E. A. S. BELL.

J. RICHARDS.

A. J. CHASE.

JAMES E. ROY.

E. F. DALDY.

APPENDIX A (1).

Constitution of fleet on 28th December 1917.

					Total number in commis- sion.	Number arrived since last report.	Number newly arrived and still fitting out.	Still due to complete programme of construc- * tion.
Sea-going vessels .. .. .	..	..	..	..	5	..	..	..
Sea-going Harbour Tugs .. .. .	..	..	..	..	27	..	..	..
Paddle Steamers .. .. .	..	..	..	..	73	..	..	2
Sternwheelers .. .. .	..	..	..	..	19	..	..	20
Up-river Tugs .. .. .	..	..	..	..	48	3	3	19
Paddle Tugs .. .. .	..	..	..	..	14	2	3	8
Motor Tugs .. .. .	..	..	..	..	4	2	2	..
Touring Launches .. .. .	..	..	..	..	26	..	..	..
Steam Launches .. .. .	..	..	..	..	78	..	5	2
Motor Launches .. .. .	..	..	..	..	365	7	11	9
Steam Barges .. .. .	..	..	..	..	13	..	..	..
Motor Lighters .. .. .	..	..	..	..	14	2	2	3
Ry. Transport Barges .. .. .	..	..	..	..	366	5	6	86
Oil Barges .. .. .	..	..	..	..	34	..	..	10
Oil Maholas .. .. .	..	..	..	..	1	..	..	..
Port Barges .. .. .	..	..	..	..	95	..	1	73
Evinrude Boats .. .. .	..	..	..	..	39	..	..	..
Hospital Screw Steamers .. .. .	..	..	..	..	5	..	..	..
Hospital Paddle Steamers .. .. .	..	..	..	..	5	..	..	2
Hospital Sternwheelers .. .. .	..	..	..	..	4	..	..	4
Hospital Motor Ships .. .. .	..	..	..	..	2	..	2	3
Hospital Barges .. .. .	..	..	..	..	1	..	..	4
Special Purpose Barges .. .. .	..	..	..	..	16	5	7	19
Hydro Glisseurs	8	1 H. G. 5 Scouts.
Special Purpose Vessels	2	3
Paddle Ambulance	2	..	2	6

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APPENDIX A (2).

*Proportion of Up-river towing ships to Up-river cargo barges.**November 25th 1916.*

								<i>Proportion.</i>
Up-river towing ships ..	..	..	..	..	..	68		1
Up-river cargo barges ..	..	..	..	..	..	93		1.38

These totals are made up of the up-river towing ships in curve No. 5 and up-river cargo barges in curve No. 6. Data sheet C.-21.

November 24th 1917.

								<i>Proportion.</i>
Up-river towing ships ..	..	..	..	..	..	135		1
Up-river cargo barges ..	..	..	..	..	..	301		2.2

These totals are made up of the up-river towing ships in curve No. 5 and the up-river cargo barges in curve No. 6. Data sheet No. C.-21.

*Proportion of up-river towing ships to all barges except hospital and port barges.**December 7th, 1917.*

								<i>Proportion.</i>
Up-river towing ships ..	..	..	..	..	..	139		1
Barges ..	..	..	..	..	..	382		2.74

These totals are made up of the up-river towing ships in curve No. 5, Data Sheet C.-21 with the addition to the P. S. T. and P. T. classes of vessels commissioned since November 24th, 1917, and all barges in the List N. C. L., list of December 7th, 1917, with the exception of hospital and port barges.

Proportion when all up-river towing ships, and all barges at present on order except hospital and Port barges, are in commission. (Not allowing repair percentage.)

								<i>Proportion.</i>
Ships ..	..	..	..	..	..	198		1
Barges ..	..	..	..	..	..	500		2.52

These totals are made up of the up-river towing ships in curve No. 8 (Data sheet C.-21) with the additions to the P. S. T. and P. T. and S. classes of ships still on order, and the addition of the newly formed P. A. class, all the barges in commission at present, of all classes except hospital and port barges, *plus* barges of all classes, except hospital and port barges, still on order and not yet commissioned.

Proportion when all up-river towing ships, and all barges at present on order except hospital and port barges, are in commission allowing percentage laid up for repairs.

								<i>Proportion.</i>
Barges ..	..	..	..	..	..	486		1
Ships ..	..	..	..	..	..	171		2.84

These totals are made up of the up-river towing ships in curve No. 15 (Data sheet C.-21), with additions to the P. S., T. P. T. and S. classes of ships still on order, and the addition of the newly formed P. A. class and all barges at present in commission, of all classes except hospital and port barges, *plus* barges on order of all classes except hospital and port barges.

The repair percentages are based on averages taken during the twelve months from November 25th, 1916, to November 24th, 1917, inclusive.

Date when up-river cargo barges to up-river towing ships became 2 : 1.

September 15th 1917.

								<i>Proportion.</i>
Ships ..	..	..	..	..	..	120		1
Barges ..	..	..	..	..	..	241		2

The craft are those composing curve Nos. 5 and 6 of Data sheet C.-21.

APPENDIX A (3).

I. W. T. Coal and Oil—burning Vessels.

(At beginning of 1918.)

Class.					Coal.	Oil.	Hulk.	Total.
Sea-going Vessels	..	..	..	S. S.	4	1	1	6
Sea and Harbour Tugs	..	..	..	S. T.	21	6	..	27
Paddle Steamers	..	..	..	P. S.	47	24	2	73
Sternwheelers	..	..	..	S.	13	6	..	19
Up-river Tugs	..	..	..	T.	16	32	..	48
Paddle Tugs	..	..	..	P. T.	6	8	..	14
Towing Launches	..	..	..	T. L.	26	..	..	26
Steam Launches	..	..	..	L.	75	3	..	78
Steam Barges	..	..	..	S. B.	11	2	..	13
Hospital Screw Steamers	..	..	..	H.	5	..	..	5
Hospital Paddle Steamers	..	..	..	H. P.	..	4	1	5
Hospital Sternwheelers	..	..	..	H. S.	3	1	..	4
Ambulance Paddlers	..	..	..	P. A.	..	2	..	2
Special Purpose Vessels	..	..	..	..	2	1	..	3

Vessels converted in Basra —

S. S. "Saaïd" from coal to oil fuel.

P. S. 39 reconverted from oil to coal.

Vessels recommended for conversion to oil —

P. S. Class	..	..	..	..	..	..	..	..	22 vessels
S.	..	..	..	..	..	..	..	..	3 "
H. S.	..	..	..	..	..	..	..	..	1 vessel.
T.	..	..	..	..	..	..	..	..	11 vessels.
S. T.	..	..	..	..	..	..	..	..	8 "
Total					..	..	..	..	45 vessels.

Note.—These vessels are shown in columns above as being coal-burning.

APPENDIX A (4).

Schedule of craft still on order (28th December 1917) in United Kingdom with approximate date of delivery, arrival, etc.

(Self-propelled craft only.)

Total on order.	Last reported position.	Date expected Basra.	Date expected to be commissioned (as expected by Fleet Register).	REMARKS.
85' Paddle Tugs .. Total 6	3 just left United Kingdom (Part), 3 to be delivered December 3rd.	1918. 3 January .. 3 March ..	1918. 2 March. 1 April. 2 June. 1 July.	
81' Tunnel Tugs .. Total 5	2 just shipped .. 1 to be delivered February. 1 to be delivered March 1 no particulars ..	2 January .. 1 March .. 1 April .. 1 no particulars	2 February. 1 April. 1 May. 1 no particulars.	
130' Tunnel Tugs steaming out. Total 12 4 taken by Admiralty leaving a total of 8.	Original total of 12 shown as it is not known which the Admiralty will take— 2 to be delivered December 3rd. 2 to be delivered January 2nd. 2 to be delivered February 1st. 2 to be delivered March 1st. 2 to be delivered April 2nd. 2 to be delivered May 3rd	 2 February .. 2 March .. 2 April .. 2 May .. 2 June .. 2 July ..	 2 March. 2 April. 2 May. 2 May. 2 June. 2 July	<i>Note.</i> The arrival of some boats steaming out may be delayed depending on the strength of the monsoons.
150' sternwheel tugs steaming out 4.	1 en route to Suez .. 1 to be delivered December 1917. 1 to be delivered January 2nd. 1 no particulars ..	1 February .. 1 March .. 1 April .. 1 No particulars	1 March. 1 April. 1 April. 1 no particulars.	
150' sternwneelers in P. and A. Total 12	1 left for United Kingdom for Karachi. 2 re-erecting at Bombay 5 for Karachi delivered United Kingdom. 4 for Basra delivered December 4th.	1 March .. 2 March .. 3 April .. 2 May .. 4 March ..	1 March. 1 March. 1 April. 2 April. 1 May. 2 May. 1 May. 1 June. 1 July. 1 August.	

APPENDIX A (4)—*contd.*

Total on order.	Last reported position.	Date expected Basra.	Date expected to be commissioned (as expected by Fleet Register).	REMARKS.
Euphrates stern-wheelers in P. and A. 4.	2 delivered December 3rd. 2 delivered January 1st	2 February .. 2 March ..	2 April. 2 May.	
Hospital paddlers 8 steaming out.	3 <i>en route</i> 5 to be delivered December 4th.	3 January .. 3 March .. 2 April ..	3 February. 3 April. 2 May.	
Hospital sternwheelers 4 steaming out 1.	1 <i>en route</i> to Suez .. 1 to be delivered December 1st.	1 January .. 1 April ..	1 February. " 1 April.	
In P. and A. for Bombay 3.	2 to be delivered January 2nd.	2 May ..	2 May.	
Hospital motorship 1	<i>En route</i> to Suez ..	February ..	March.	
110' paddle tug steaming out 1.	<i>En route</i> to Suez ..	February ..	February.	

Note.—The dates of expectation given above are fixed on the assumption that vessels or parts of vessels carried on transports from the United Kingdom take a period of one to two months to reach their destination; and that vessels coming from the United Kingdom under their own power take a period of between two and three months to reach Basra. Much longer times have been occupied, *e.g.*—

P. T. .. 13 Left Malta 21st April 1917 .. Arrived Basra .. 14th October 1917.

P. T. .. 3 Arrived Aden .. 6th June 1917 .. " " .. 14th October 1917.

P. T. .. 46 Left U. K. July 1916 .. Not yet in service.

P. T. .. 47 " " July 1916 .. " "

P. T. .. 48 " " July 1916 .. " "

Dredger "Quorrah" arrived Dakar, 10th May 1917. Not yet arrived.

H. M. 3. *En route* to Gibraltar 31st August 1917. Left Suez, 20th October 1917.

Refrigerator Barge R. B. 7 left Bizerta, 20th July 1917; only arrived Aden, 7th October 1917.

Filtration Barge F. B. 2. Arrived Port Said, 28th June 1917. Only left Suez, 9th November 1917.

Filtration Barge F. B. 4. Arrived Gibraltar, 27th May 1917. No further report.

APPENDIX A (4) SUPPLEMENTARY.

*Craft on order in India.**14th December 1917.*

Class.	No.	Designation letters and services Nos.	Leading dimensions.	Source of supply.	En route.
Paddle Steamers ..	2	Taraki } Swati P.S.-95. } P.S.-90.	245'×36'×9'—5".	River Steam Navigation Co., Calcutta.	Taraki Swati.
Tugs ..	Nil	....	..	Nil.	
Towing Launches ..	Nil	....	..	Nil.	
Steam Launches pinnaces.	12	Number not yet given.	35'×8'×6'—0"	Order placed 19th September 1917.	

Note.—This total has been cancelled to 2. (29th December 1917.)

Hospital Motorships	2	H. M. 5 and H. M. 6.	160'×30'×6'—0"	Building at Burn and Co., Calcutta.	
Motor Launches ..	10	..	..	1 Dacca Gift Launch Kapurthala, Punjab, 1st and 2nd Gujran- walla. Patiala No. 13. 4 Red X Motor Launches construct- ing at Calcutta.	
River or Port Barges as may be decided for each vessel.	4	175, 661, 662, 663 ..	150'—0"	..	..
	9	641, 642, 643, 644, 645, 646, 647, 648, 649.	125'—0"	..	Building in India.
Composite ..	9	650, 652, 654, 655, 656, 657, 658, 659, 660.	125'—0".	..	..
Port Barges ..	76	204 to 209; 214, 217—234, 248—286 288, 289—299.	50'—0"	..	Telegram No. 1567, dated the 27th June 1917, to Hablistas, India.
Terminal pontoons.	3	Similar to those supplied to Kotah State.	..	..	Telegram No. 692, dated 17th October 1917, from Muni- tions Board, Simla.
Oil Barges ..	6 3 3	0—20 to 25 .. 0—26 to 28. Reserved.	160'—0" "	..	Telegram from War Section, Simla, No. 75199 of 5th December 1917.
Tigris and Euphrates road bridge pon- toons.	110	..	30'×12'×4"	..	Telegram from the General Head Quar- ters to Simla, No. 0-704 of 8th November 1917.

APPENDIX A (5).

Distribution of Motor Boats at end of 1917.

Baghdad	..	..	..	..	..	..	67	
Kut	..	..	..	..	..	..	16	
Amara	..	..	..	..	..	..	24	
Basra	..	..	..	..	..	..	110	
Political	..	..	..	..	..	..	22	
Y. M. C. A.	..	..	..	..	..	..	1	
Soldiers' War Fund	..	..	..	..	..	..	1	
Medical Embark	..	..	..	..	..	..	3	
								244
Boats burnt or sunk	..	..	..	..	..	..	12	
Boats without engines	..	..	..		..	..	7	
								19
Fire floats	..	..	..	..	..	..	..	2
Oil barges	..	..	..	..	..	..	..	3
Red Cross	..	..	..	..	..	..	..	65
E. M. O.	..				..	..	..	32
					Total	..	..	365

APPENDIX B (1).

DISTRIBUTION OF INLAND WATER TRANSPORT PERSONNEL.

For week ending 29th December 1917.

	B. O.	W. O. R. I. M.	Civil Officers.	Clerks.	BRITISH OTHER RANKS.					I. O. and I. O. R.	Motor Drivers.	Floating establishment.	Local I. W. T.	LABOUR.		Total.	M. L. B.	Local skilled and unskilled.	10th Jail Porter Corps.	Total.
					R. E.	B. W. I.	R. E. Col. Sec.	Attached.	African details.					Skilled.	Unskilled.					
Headquarters ..	9	..	..	10	31	8	..	8	..	..	37	..	6	..	109	..	..	..	..
Transport ..	7	2	..	3	3	..	..	..	..	..	11	..	..	..	26	..	..	..	..
Construction ..	22	..	..	3	166	1	2	4	146	..	60	..	1,324	2,023	3,751	76	57	..	133
Accounts ..	15	..	2	49	22	1	..	18	..	..	9	..	..	..	116	..	..	..	..
Drafting and Q. M. S.	6	..	1	25	6	2	1	3	1	..	14	..	..	..	59	..	..	..	..
Up river works ..	28	..	2	23	149	47	3	8	..	5	244	278	684	1,837	3,308	..	2	..	..
Up-river workshops	16	2	1	6	91	1	..	7	..	..	66	17	455	85	745	..	2	..	..
Dockyard ..	30	2	3	16	167	2	..	29	..	..	388	..	2,796	359	3,792	..	7	..	..
Port Traffic ..	15	..	17	103	47	29	3	21	..	..	77	1	8	1,059	1,440	..	1,323*	..	132
Buoyage Pilotage	30	3	1	5	42	9	2	1	7	..	95	281	16	274	766	..	..	..	..
Stores, Magil ..	11	..	..	14	46	13	..	5	..	..	87	..	8	513	697	..	..	..	..
Coal and Fuel Depot	7	..	..	4	16	..	..	..	..	3	54	..	..	386	470	..	4	184	188
Barge Depot ..	6	4	..	2	25	80	..	4	2	2	309	3	194	9	640	..	10	..	10	
Native Craft ..	30	..	..	29	88	4	2	3	..	4	20	402	..	..	651	..	6,006†	..	6,006

S129(w)AD	Craft re-erection, { Magil Mohammerah	25	..	4	4	109	..	..	1	..	..	92	..	2,722	..328	3,285	186	..	186
		2	..	2	4	..	..	..	..	..	1	36	..	350	43	546	..	..	..
Marine Engineering	..	8	..	2	..	6	..	..	..	..	..	3	..	..	..	19	..	..	..
Vessels	8	..	..	..	15	..	..	2	..	..	118	..	206	21	370	..	..	..
Afloat	226	28	30	..	300	..	..	13	137	..	9,641	..	..	..	10,375	..	..	..
Motor Dockyard ..	{ Basra Baghdad	8	7	..	..	173	66	6	4	29	57	807	..	403	..	1,572	..	5	5
River Conservancy	..	12	..	1	4	9	..	..	..	1	..	36	..	..	1	70	..	45	45
Magil Filtration	6	..	..	..	15	..	..	..	..	..	..	..	66	86	173	..	..	..
Towing Office	3	..	1	..	9	..	..	..	..	..	3	..	..	..	16	..	..	..
Fleet Registrar	4	..	..	1	3	..	..	..	..	..	3	..	..	..	11	..	..	..
Anglo-Persian Company	..	4	..	..	..	..	..	..	..	..	..	..	..	..	..	4	..	..	..
Refrigeration	1	..	..	..	19	..	..	1	..	..	..	..	54	9	84	..	..	..
Glisseurs	5	..	..	..	..	..	..	..	3	3	11	..	..	..
Miscellaneous	..	3	..	..	..	..	..	..	..	2	..	..	..	7	..	12	..	..	..
Motor Lighters	1	..	..	..	6	..	..	..	..	..	..	..	20	..	27	..	..	..
Hospital replacement stores	..	1	..	..	..	1	..	..	..	..	..	..	..	..	..	55	..	..	..
Camps, Base and Keshla	3	2	..	..	117	..	..	16	17	..	..	..	..	25	219	..	..	..
Headquarters and Seraji	26	3	4	4	7	..	135	..	..	..	179	..	..	..
Khora Creek	..	2	..	..	1	..	38	5	..	1	..	81	..	1	..	129	..	..	..
Magil	1	..	..	3	53	2	133	7	..	2	132	..	13	50	396	14	11	25
Tanooma	..	3	1	..	4	16	42	1	2	..	..	176	..	9	14	268	..	..	..

*Includes the only Indian Officer in the I. W. T. †Local Crew on Native Craft paid on contract.

APPENDIX B (1)—*concd.*

	B. O.	W. O. R. I. M.	Civil Officers.	Clerks.	BRITISH OTHER RANKS.				Motor Drivers.	Float- ing Estab- lishment.	Local I. W. T.	LABOUR.		Total.	M. L. B.	Local skilled and un- skilled.	10th Fall Porter Corps.	Total.
					R. E.	B. W. I.	R. E. Col. Sec.	Attached.	African details.			Skilled.	Un- skilled.					
I. W. T. O. Magl..	..	3	2	..	1	3	..	..	..	42	..	..	..	51	..	40	..	40
Kurna	..	2	1	..	..	4	..	..	..	92	..	1	97	199	..	..	..	..
Lover Euphrates..	..	3	..	..	..	..	..	..	..	..	..	..	..	3	..	..	..	..
Nasiriyeh	..	2	2	..	1	4	1	1	..	88	6	..	..	105	..	..	..	..
Qualet Saleh	..	1	..	..	..	2	..	..	..	16	..	..	..	19	..	..	..	..
Narrows	..	9	2	..	2	48	1	2	..	225	..	..	..	287	..	..	..	..
Amara	..	15	4	..	7	29	..	5	..	458	..	..	..	527	..	..	..	..
Sheikh Saad	..	1	..	..	..	1	1	..	..	33	..	..	..	37	..	..	..	..
Ali Gharbi	..	1	..	..	3	3	..	..	..	36	..	..	..	45	..	25	..	25
Kut-el-Amara	..	8	..	..	7	16	..	..	..	108	1	2	100	242	..	..	..	..
Aziziyeh	..	1	1	..	1	1	..	..	..	103	..	..	8	115	..	..	..	..
Baghdad	..	1	..	..	1	2	..	..	..	23	..	..	..	27	..	..	..	..
Baghdad	..	2	..	..	..	6	1	..	..	13	..	..	..	22	..	..	..	..
Baghdad Bridges	..	8	2	..	..	33	1	8	..	..	26	..	24	102	..	156	..	156
Upper Euphrates..	..	3	..	..	2	1	..	..	..	22	..	..	..	28	..	..	..	..

	B.O.	W.O.R.I.M	Civil Officers.	Clerks.	BRITISH OTHER BANKS.				L.O.&I.O.R.	Motor Drivers.	Float- ing Estab- lishment.	Local L. W. T.	LABOUR.		Total.	M. L. B.	Local skilled and un- skilled.	10th Jail Porter Corps.	Total.
					R. F.	B. W. I.	R. E. Col. Sec.	Attached.					Skilled.	Un- skilled.					
I. W. T. O Magl..	3	2	..	1	3	..	..	..	..	..	42	..	..	..	51	..	40	..	40
Kurna	2	1	..	..	4	2	..	..	..	..	92	..	1	97	199	..	..	..	..
Lower Euphrates..	3	..	..	..	..	..	..	..	..	..	..	..	..	..	3	..	..	..	..
Nasiriyeh	2	2	..	1	4	..	1	1	..	..	88	6	..	..	103	..	..	..	..
Qualet Saleh	1	..	..	..	2	..	..	..	..	..	16	..	..	..	19	..	..	..	..
Narrows	9	2	..	2	48	..	1	2	..	..	223	..	..	..	287	..	..	..	..
Amara	15	4	..	7	29	9	..	5	..	..	438	..	..	..	527	..	..	..	..
Sheikh Saad	1	..	..	..	1	1	1	..	..	..	33	..	..	..	37	..	..	..	..
Alh Gharbi	1	..	..	3	3	2	..	..	..	..	36	..	..	..	45	..	25	..	25
Kut-el-Amara	8	..	..	7	16	..	..	..	..	..	108	1	2	100	242	..	..	..	..
Aziyeh	1	1	..	1	1	..	..	..	..	..	103	..	..	8	115	..	..	..	..
Baghala	1	..	..	1	2	..	..	..	..	..	23	..	..	..	27	..	..	..	..
Baghdad	2	..	..	..	6	1	..	..	..	..	13	..	..	..	22	..	..	..	..
Baghdad Bridges	8	2	..	..	33	..	1	8	..	..	..	26	..	24	102	..	156	..	156
Unskilled, Baghdad ..	3	..	..	2	1	..	..	..	..	..	22	..	..	..	28	..	..	..	..
Musayib	2	..	..	2	2	..	..	..	..	..	2	..	..	..	8	..	..	..	..
Mufraz	2	..	..	1	12	..	..	..	..	..	24	8	..	..	47	..	..	..	..
Advanced Base	7	..	..	6	12	1	17	6	..	..	168	2	..	..	217	..	..	..	..
Ahwaz ..	1	..	..	..	4	..	..	..	..	..	10	..	..	..	15	..	..	..	..
Musqat ..	1	..	..	..	..	..	..	..	..	..	10	..	..	..	11	..	..	..	..
D. D. I. W. T. Baghdad	3	..	..	2	6	4	1	..	..	..	18	..	..	..	34	..	..	..	..
Hinaidi	3	..	..	..	2	..	..	..	..	..	36	..	..	..	41	..	..	..	..
Nahr Umr	7	1	..	2	6	..	..	..	..	..	33	..	27	61	456	..	..	..	..
Abadan	1	..	..	..	..	..	..	..	..	..	8	..	..	..	9	..	..	..	..
In Hospital	20	2	1	19	113	14	15	8	54	..	464	..	..	520	1,442	35	*40	5	89
In Reserve and on way to stations	20	4	..	3	108	..	..	9	..	..	..	..	327	369	840	..	..	..	..
Total	688	71	68	433	2,218	382	198	203	723	79	14,881	1,177	9,901	8,359	39,381	311	7,742	189	8,242

*Are Persons paid by contractors.
(Grand Total = 39,381 8,242 = 47,623.)

APPENDIX B (2).

Proposed deck-crews for Inland Water Transport Fleet.

January 1918.

Class.	Ships.	Total Ships.	Officers.	Sappers.	2nd Class Mas- ters.	3rd Class Mas- ters.	Serangs.	Tindals.	Cassubs.	Sea-cummies.	Lascars.	Bhandaries.	Carpenters.	Total.	Grand Total.
1	IVY	1	3	1	..	..	1	1	1	3	14	1	1	26	26
2	P. S. 90, 91, 92, 93, 94, 95, 96, 97.	8	2	1	..	..	1	1	1	3	14	1	1	25	200
3	H. P. 2, 3, 4, 5, P. A. 1, 2, 3, 4, P. S. 21, 50, 51, 52, 53, 54, 55, 56, 58, 59, 60, 61, 89.	21	2	1	..	..	1	1	1	3	12	1	1	23	483
4	H. S. 1, 11, 12, S. 1, 10,	5	1	1	..	..	1	1	1	3	10	1	1	20	100
5	P. S. 1, 2, 3, 4, 16, 17, 20, 22, 23, 24, 27, 28, 87.	13	..	3	..	..	1	1	1	3	10	1	1	21	273
6	P. S. 25, 29 S. 40, 44.	4	2	1	..	..	1	1	1	3	8	1	..	18	72
7	H. M. 1, 2, 3, 7 ..	4	1	1	..	..	1	1	1	3	8	1	..	17	68

APPENDIX B (2) --contd.

Class.	Ships.	Total. Ships.	Officers.	Sappers.	2nd Class Mas- ters.	3rd Class Mas- ters.	Serangs.	Tindals.	Cassubs.	Sea-cunies.	Lascars.	Bhundaries.	Carpenters.	Total.	Grand Total.
17	Saaid-Neamotha ..	2	..	1	..	..	1	..	..	2	6	1	..	11	22
18	H. 1, 2, F. 1, 2, 3, 4, 5, 6, 7, 8.	10	1	..	..	..	1	..	..	2	4	1	..	9	90
19	S. T. 7, 8, 10, 11, 25, 27, Pahlwan.	7	..	..	1	1	..	..	..	2	4	1	..	9	63
20	S. B. 1, 2, 3, 4, 5, 8, 9, 10, 11, 12	10	..	..	..	2	..	..	..	2	4	1	..	9	90
21	S. 5, 7, 8, ..	3	..	..	1	..	..	1	..	1	3	1	..	7	21
22	T. L. 1, 2, 3, 8, 25, 29, 31.	7	..	..	..	1	..	..	..	..	3	1	..	5	35
23	T. 12, 14 ..	2	..	..	..	1	..	..	..	..	2	1	..	4	8
24	T. L. 4, 5, 6, 9, 10 11, 12, 14, 15, 16, 20, 21, 22, 23, 24, 26, 27, 28, 30. Arab.	20	..	..	..	1	..	..	..	..	2	1	..	4	80

keep night running low till navigating officers get more familiar with such navigation, and in the result steaming time is low. There have also been considerable detentions at Basra and Amara due to traffic not being available for shipment, and at Basra due to necessity for loading in detail instead of in bulk. This has meant detention to vessels and the consequent comparatively low proportion of steaming time.

133. The comparatively high proportion of repair time is, in part, due to the fact that the workshops at the different centres have been only recently developed, that owing to lack of berthing accommodation at the dockyard, vessels have had to be dealt with away from the yard, and owing to the lack of slipway accommodation under water repair to vessels has had to be done on the hard with all the restrictions resulting from tidal working.

To meet all these difficulties, which have tended to keep the operating value of the fleet comparatively low, every effort is being made to improve channels and keep them well marked, and the dockyard and up-country workshops have been developed into well-organised, well-equipped and efficient establishments where all classes of work will be done in reasonable time.

134. Beyond providing the carrying vessels and controlling their movements, the Inland Water Transport Directorate has little to do with the traffic, and this arrangement is a great departure from the principles underlying commercial working. To ensure that the greatest value may be got out of the space available in carrying vessels, commercial working provides that the technical officers working the fleet should allocate the vessels for the traffic to be carried, should apportion the loads, should arrange loading and should arrange for and control discharge. None of these functions is at present performed by the officers of the carrying concern; that is the Inland Water Transport. They are performed by non-technical staff officers in the Inspector-General of Communications' office, who consult with the Inland Water Transport Directorate in making the arrangements. There must be a considerable loss of efficiency under the arrangement. The maximum carrying efficiency of the service cannot be attained till the present system of detailed loading by the shipper is abandoned, and until the traffic is given in such quantities to the carrier as will allow of systematic loading to get the most out of the available tonnage.

135. The remarks in the preceding paragraph apply most markedly to Basra clearances but the same arrangement is followed at the transshipment stations of Amara, Kut, Hinaidi and Advanced Base (Right bank) and cannot but militate against securing the best possible clearances. The operating officers have in certain cases found the sanctioned arrangement so hampering to their work that they have arranged a compromise which gives more liberty of action to the carrier.

136. The tonnage carried and the mileage run by the fleet shew a steady progression during the past year, which was of course to be expected as a result of the growth of the fleet. Appendix C (6) shows the increase in ton-mileage as compared with the increase in numbers and tonnage of the fleet. The comparative result is reasonably satisfactory, the ton-mileage having risen in the same proportion as the increase in barge tonnage, but in considerably greater proportion than the increase in towing steamers.

137. It is practically impossible to assess the value of the work done in comparison with the carrying capacity of the ships. The results as they stand, in relation to the maximum capacity of the fleet employed, show badly. This, however, is unavoidable where the traffic is only in one direction. Further, the fleet is largely composed of vessels which were designed to give their maximum results under quite different conditions. Steamers which under the conditions they were designed for could efficiently tow 2,000 tons are here employed under such conditions as restrict their tow to a maximum of 800 tons; and others which can efficiently carry a load of approximately 600 are, by the conditions under which they work, restricted to loads of 400 tons. We have been advised by the Director of Inland Water Transport that, with a view to giving these powerful steamers a heavier tow, he was arranging to give them three flats instead of two when necessary.

The loss in working efficiency is further increased by the fact that many of the paddle steamers employed have their wheel immersion designed to give the best result at a draft in excess of the possible working drafts in Mesopotamia.

APPENDIX B (3).

PROPOSED MINIMUM ESTABLISHMENT AFLOAT.

Engine Room ratings.

Ships.	Officers.	C. S. Mr.	N. C. Os.	Sappers.	Drivers.	Serangs.	Tindals.	Greasers.	Firemen.	Trimmers.	Bohandaries.	Ships.	Total.	Bohandaries.	Trimmers.	Firemen.	Greasers.	Serangs.	Tindals.	Drivers.	N. C. Os.	Sappers.	Officers.	C. S. Mr.	Total
IVY ..	2	..	2	..	3	1	2	6	8	4	1	29	P. S. 18, 49	..	..	..	..	..	..	3	..	..	..	..	..
P. S. 89 ..	3	..	..	..	4	1	1	6	9	3	1	28	"Kalka"	..	..	..	..	..	..	2	..	..	..	..	..
P. S. 50-61 ..	3	..	..	..	3	1	2	3	6	2	1	21	S. 3, 4, 9	..	..	..	..	..	..	2	..	..	..	..	..
H. P. 8-12 ..	1	..	..	..	3	1	1	3	7	2	1	20	Saad ..	..	..	..	..	..	..	2	..	..	..	..	..
P. S. 91-97 ..	1	..	..	..	3	1	1	3	7	2	1	20	"Nomotha"	..	..	..	..	..	..	3	..	..	..	..	..
P. S. 1-4, 25, 83..	1	..	..	..	3	1	1	3	7	3	1	20	P. S. 5-7	..	..	..	..	..	..	2	..	..	..	..	..
P. S. 16-24, 27, 28, 57	1	..	..	..	3	1	1	3	7	2	1	19	S. T. 6-8	..	..	..	..	..	..	2	..	..	..	..	..
S. L. H. S. 1 ..	1	..	..	..	3	1	1	2	7	2	1	18	S. T. 12, 14, 19, 21, 24, 26	..	..	..	..	..	..	1	..	..	..	..	..
S. 2 ..	..	..	..	..	3	1	1	2	7	2	1	17	S. T. 13 ..	..	..	..	..	..	..	2	..	..	..	..	..
P. S. 20 ..	..	..	..	..	3	..	1	3	7	2	1	17	H. 1, 2 ..	..	..	..	..	..	..	2	..	..	..	..	..
H. S. 5-8 ..	1	..	..	..	2	1	1	2	7	2	1	17	S. T. 1 11, 23, 25, 27, 28	..	..	..	..	..	..	2	..	..	..	..	..
H. S. 11, 12 ..	1	..	..	..	3	1	2	3	4	2	1	17	S. R. 6, 7	..	..	..	..	..	..	2	..	..	..	..	..
H. P. 1 ..	2	..	..	..	2	..	1	2	7	2	1	17	S. 30, 32	..	..	..	..	..	..	1	..	..	..	..	..
H. P. 2, 5 ..	2	..	..	..	3	1	1	3	4	2	1	17	T. 1-19	..	..	..	..	..	..	2	..	..	..	..	..
P. S. 14, 15 ..	1	..	..	..	2	..	1	2	7	2	1	16	P. S. 8-10	..	..	..	..	..	..	3	..	..	..	..	..
P. S. 1 ..	1	..	..	..	2	..	1	2	7	2	1	16	P. S. 13	..	..	..	..	..	..	2	..	..	..	..	..

APPENDIX B (3).

PROPOSED MINIMUM ESTABLISHMENT Afloat.

Engine Room ratings

Engine Room ratings													
Ships.	Officers.	C. S. M.	N. C. Os.	Sappers.	Drivers.	Sorangs.	Tindals.	Greasers.	Firemen.	Trimmers.	Bhandarries.	Total.	Ships.
IVY ..	2	..	2	..	3	1	2	6	8	4	1	29	P. S. 18, 49
P. S. 89 ..	3	..	..	..	4	1	1	6	9	3	1	28	"Kahka"
P. S. 50-61	3	..	..	..	..	..	..	..	..	..	..	..	S. 3, 4, 9
H. P. 8-12		..	..	..	..	..	..	..	..	..	..	..	Saad ..
P. S. 91-97	1	..	..	1	3	1	1	3	7	2	1	20	"Nimotha"
P. S. 1-4, 25, 88..	1	..	..	..	3	1	1	3	7	3	1	20	P. S. 5-7
P. S. 10-24, 27, 28, 37	1	..	..	..	3	1	1	3	7	2	1	19	S. T. 6-8
S. 1. H. S. 1	1	..	..	..	3	1	1	2	7	2	1	18	S. T. 12, 14, 19, 21, 24, 26
S. 2 ..	..	..	..	..	3	1	1	2	7	2	1	17	S. T. 13 ..
P. S. 26	..	..	..	..	3	..	..	1	3	2	1	17	H. 1, 2 ..
H. S. 5-8	1	..	..	..	2	1	1	2	7	2	1	17	S. T. 11, 23, 25, 27, 28
H. S. 11, 12	1	..	..	..	3	1	2	3	4	2	1	17	S. R. 6, 7
H. P. 1 ..	2	..	..	..	2	..	..	1	2	7	2	17	S. 30 ..
H. P. 2, 5	2	..	..	..	3	1	1	3	4	2	1	17	T. 1-19
P. S. 14, 15	1	..	..	..	2	..	..	1	2	7	2	16	P. S. 8-10
P. S. 31, 32, 35	..	..	..	..	3	..	..	1	2	7	2	16	T. 20-31, 36-39, 63, 66, 68, 70, 71, 74, 76, 77, 79, 82, 86, 87.
P. S. 29, 80, 86	1	..	..	..	3	1	1	3	4	2	1	16	T. L. 7, 8
S. 10 ..	1	..	..	1	3	1	1	3	3	2	1	16	S. 5-8 ..
H. M. 1-3	4	..	..	..	1	1	1	5	3	..	1	16	S. B. 1-5, 8, 9, 12
S. T. 15, 16	..	..	1	..	2	..	2	2	6	2	..	15	T. L. 1-6, 20-30
P. S. Salimi	..	..	..	..	2	..	1	2	7	2	1	15	L. 32, 38, 46, 48, 52, 54
S. 40-44	1	..	..	1	2	1	1	2	4	2	1	15	T. L. 9, 12, 14, 16
S. V. 1 ..	1	..	..	..	2	1	1	2	4	2	1	14	L. 79-82, 90, 92
P. S. 36-39	..	1	..	..	2	1	1	2	4	2	1	14	M. L. Class
P. T. 12-15, 46, 47, 49	1	..	..	1	2	..	2	2	3	1	1	13	H. 3, 4, 5, L. 1, 2, 4, 7, 10, 11-37, 38-41, 44, 45, 56, 57-79
P. T. 40-45	..	1	..	..	1	..	1	2	6	2	..	13	L. 49-51, 56, 83 ..
T. 64 ..	..	..	1	..	1	..	1	2	6	2	..	13	Citra ..
S. T. 19	..	..	1	..	2	..	1	2	5	2	..	13	..
P. T. 48..	..	..	..	..	2	..	1	2	6	2	..	13	..

NOTE.—The crews are being reduced to the numbers shown on this list. This work was started in December 1917, and is still in progress.

	Motor Lighter Depot.	S. of V.	Survey Party.	Buoyage and Pilotage.	Sheikh Saad.	Nasriyeh.	Ezra's Tomb.	Narrows.	Ah Ghuba.	Baghdah.	Coal Depot.	Mekhemneh.	L. W. T. Camp B.	Nahr Umr.	Upper works, Nahr Umr.	C. N. C.	Upper works, B.	Upper works, A.	Qana.	Dockyard.	Piers.	Motor Dockyard.
Deck Serangs ..	..	4	1	1	2	1	1	3	..	2	1	1	..	..	..	..	..	1	2	..	1
Lascars Tindalls ..	..	4	2	3	6	1	1	2	1	3	1	2	..	1	..	5	..	..	1	..	2
Seacunnies ..	..	1	3	..	1	1	..	6	6	..	..	..	..	..	..	1	1	1	1	..	3
Lascars ..	4	43	17	37	67	17	30	76	17	8	..	4	1	18	..	10	1	4	42	..	29	
Ship Carpenters ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Deck Cassubs ..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	..	..
Barge Tindals ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Barge Lascars ..	..	6	..	..	..	..	..	..	..	39	..	..	..	..	..	..	..	..	..	..	..
Butlers ..	..	..	..	..	1	1	..	1	..	..	1	2	..	1	..	..	..	..	..	1	..
General Mess Servants ..	2	..	2	..	..	..	1	2	2	3	4	4	1	..	3	1	4	..	1	11	..
Cooks ..	1	..	..	..	1	3	1	6	1	2	2	1	1	1	1	2	4	2	1	1	..
Cooks' Mates ..	1	1	..	..	1	1	1	..	1	..	..	2	11	1	3	4	2	..	8	1	..
Masalchies ..	2	..	..	..	..	1	1	..	1	..	..	1	5	3	2	..	..	..	..	10	..
Topasses ..	..	..	3	..	4	1	3	12	1	3	..	10	19	4	8	12	..	11	6	62	..
Bhandaries ..	1	8	..	..	4	3	..	..	1	2	..	..	2	..	..	1	..	..	1	1	..
Electricians ..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	1	..	2	1	..	3	..
Engine Drivers ..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	3	..	1	3	..	..	..
Stoker Serangs ..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	1	..
Stoker Tindals ..	..	..	..	..	..	1	..	..	..	..	1	..	..	..	1	..	..	..	..	1	..
Stokers ..	..	8	..	3	1	10	1	..	1	..	35	..	1	1	8	5	6	3	5	50	..
Coal Trimmers ..	..	..	..	2	..	..	..	1	..	..	..	..	4	..	..	1	..	..	3	..	..
Greasers ..	..	..	..	..	..	1	1	..	1	..	..	..	..	..	..	..	..	..	..	..	..
Engine Room Cassubs ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
2nd Class Masters ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
3rd Class Masters ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..
Dhobies.. ..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
TOTAL ..	11	76	28	46	88	42	41	111	32	63	46	27	45	20	31	42	21	26	74	142	..	

APPENDIX B (5).

Rejections of skilled labour at Dockyard.

Trades.	INDIAN LABOUR.			CHINESE LABOUR.		
	Arriving 27-7-17 to 21-11-17.	Returned inefficient 6-8-17 to 29-11-17.	Approx. proportion returned.	Arriving 27-7-17 to 21-11-17.	Returned inefficient 6-8-17 to 29-11-17.	Approx. Proportion returned.
			Per cent.			Per cent.
Acetylene Welder ..	7	1	14	..	..	..
Armature Winder ..	3	..	..	..	..	..
Boiler Makers ..	1	1	100	191	76	40
Blacksmith	31	21	68	36	24	66·3
Boat Builders.. ..	8	8	100	26	1	4
Carpenters .. ..	..	..	..	51	12	24
Coppersmiths ..	5	..	..	18	..	..
Caulkers	13	..	..	..	..	..
Crane and Engine Driver	6	..	..	..	..	..
Electrical Installation Repairers.	2	1	50	..	..	..
Fitters	182	93	50	245	181	74
Hammermen	55	36	65·5	..	..	..
Machinemcn	32	2	6	77	47	61
Masons, Bricklayers ..	13	..	..	..	..	..
Moulders	36	31	86	49	16	33
Painters	26	..	..	..	..	..
Patternmakers ..	..	..	..	16	..	..
Platers .. ..	..	..	..	*102	37	36
Plumbers .. ..	..	..	..	9	4	44·3
Pipelayers	2	..	..	..	..	..
Sailmakers	20	..	..	..	..	..
Tinsmiths	5	..	..	18	..	..
Turners	16	5	31	101	34	34
Wiremen	110	37	34	..	..	..
TOTAL ..	573	236	41	939	432	46

Combined total skilled labour 1,512 arrival. 668 departure. 44% inefficient.

* NOTE.—Of this number of Chinese Platers 64 arrived 30th June 1917, a number of the departures being from the gang.

APPENDIX B (6).

Average local skilled labour employed monthly by Inland Water Transport.

1917.

January	..	..	..	..	..	..	..	30
February	..	..	..	..	..	..	..	30
March	..	..	..	..	..	..	..	30
April	..	..	..	..	..	..	..	30
May	..	..	..	..	..	..	..	184
June	..	..	..	..	..	..	..	265
July	..	..	..	..	..	..	..	532
August	..	..	..	..	..	..	..	549
September	..	..	..	..	..	..	..	623
October	..	..	..	..	..	..	..	718
November	..	..	..	..	..	..	..	722
December	..	..	..	..	..	..	..	837
S120(w)AD								

APPENDIX B (8).

FROM BRIGADIER-GENERAL² R. H. W. HUGHES, DIRECTOR, INLAND WATER TRANSPORT,
TO MAJOR-GENERAL H. F. E. FREELAND, C.B., M.V.O., D.S.O., R.E., IN CHARGE WAR
OFFICE, MESOPOTAMIAN MISSION, DATED BAGHDAD, THE 8TH FEBRUARY 1918.

With reference to the question asked me yesterday at your conference about the sea-going firemen and trimmers employed in the Inland Water Transport. The following telegram has been received from the Superintendent of Personnel in reply to my wire instructing him to ascertain what proportion there were amongst the total number :—

Total number of firemen and trimmers, 3,074. Of these I estimate that 30% have had sea-going experience. It is impossible to give a more accurate statement without having each man questioned and then we should have to accept the man's word. India has never supplied details of men's previous careers when forwarding the men. At present there are 294 firemen and trimmers awaiting passage time expired of these actually 146 have had sea experience. These are some of the older Royal Indian Marine ratings. The later arrivals I feel certain are not in as great a proportion.

I am now instructing him that accurate information is to be obtained as soon as possible, but you will understand that this will probably take three weeks or a month to collect on account of the absence of many ships from their bases.

APPENDIX B. (9).

Statement showing numbers of men on Strength and in Hospital in the Inland Water Transport personnel on 22nd December 1917.

					Total on Strength.	In Hospital.	Percentage.
British Officers	..	..	..	..	693	29	4.3
Warrant Officers, R. I. M.	..	..	..	..	71	2	2.7
Civilian Officers	..	..	..	..	70	2	2.7
Clerical Est. Establishment	..	..	..	..	421	19	4.5
B. O. R. R. E.	..	..	..	..	2,184	106	4.8
Do. B. W. I.	..	..	..	..	382	21	5.5
Do. Coloured Section	..	..	..	..	198	15	7.5
Do. Attached	..	..	..	..	200	8	4.0
Nigerians and West Africans	..	..	..	..	697	51	7.3
I. O. and I. O. Rs	..	..	..	..	79	4	5.0
Floating Establishment	..	..	..	..	14,685	464	3.1
Skilled Labour I. W. T.	..	..	..	..	10,027	294	2.9
Unskilled Labour, I. W. T.	..	..	..	..	8,541	558	6.5
Local ditto	..	..	..	..	1,052	..	..
Attached Labour	..	..	..	..	8,171*	98	4.3
				Total	47,469	1,671	
					*8,171 5,926		
					2,245		
Deduct C. N.	..	..	..	..

31st July 1917.

					Strength.	In Hospital.	Percentage.
British Officers	..	..	..	..	437	47	10.7
Warrant Officers, R. I. M.	..	..	..	..	68	2	3.0
Civilians	..	..	..	..	74	4	5.4
Clerks	..	..	..	..	321	16	5.0
B. O. Rs.	..	..	..	..	1,494	247	16.7
R. E. Coloured Sec.	..	..	..	..	217	16	7.3
B. W. I.	..	..	..	..	395	24	6.0
Attached	..	..	..	..	206	24	11.6
Nigerians	..	..	..	..	80	4	5.0
I. O. Rs.	..	..	..	..	85	3	3.5
Floating Establishment	..	..	..	..	11,955	576	4.8
Skilled Labour	..	..	..	..	8,410	422	5.0
Unskilled Labour	..	..	..	..	3,886	334	8.5
				Total	27,628	1,719	

APPENDIX C (4).

Statement of Tonnage, Ton-Mileage and Mileage of Native Craft from September 30th to December 22nd, 1917.

Period.					Tonnage d. Sp. L. & L. Up. & D. Down Stream.	Ton-mileage.	Mileage.
W. E.—							
October 6th	..	..	..	..	8,454.01	712,096	84.22
„ 13th	..	..	..	..	6,171.90	439,030	69.74
„ 20th	..	..	..	..	8,182.93	687,259	85.24
„ 27th	..	..	..	..	7,806.56	554,970	71.69
November 3rd	..	..	..	..	5,947.45	417,788	70.24
„ 10th	..	..	..	..	9,206.66	799,319	85.84
„ 17th	..	..	..	..	7,814.11	482,546	61.75
„ 24th	..	..	..	..	7,495.46	557,209	74.34
December 1st	..	..	..	..	9,106.67	612,212	67.22
„ 8th	..	..	..	..	6,660.01	375,939	56.44
„ 15th	..	..	..	..	7,558.73	408,378	54.02
„ 22nd	..	..	..	..	8,765.77	669,108	76.30
12 weeks	..	..	..	..	93,170.	6,697,854	856.37
Weekly Average	..	..	..	..	7,764	558,154	71.36

Group.				Total No. of boats on Group.	Actual average carrying capacity per boat.	Actual Total carrying capacity.	No. of boats allotted Up River Transport.	Carrying Capacity of boats on Up River Transport.
A Class	..	..		203	39	7,917	145	5,655
B „	..	..		211	29	6,119	186	5,394
C „	..	..		124	18	2,232	92	1,656
D „	..	..		395	13	5,135	204	2,652
E „	..	..		136	6	816	7	42
Buggalows	..	..		7	38	266	7	266
Port Boats	..	..		99	29	2,871	..	..
Total				1,175	..	25,356	641	15,665
Less 10½% deduction for average number of boats repairing at any one time.				1,051	..	22,693	573	14,020

APPENDIX C (5).

Statement of Steaming Time and Repair Time of Principal Self-propelled Vessels for September, October and November 1917.

Ship.			Average Steaming days per mensem.		Average repair days per mensem.		Ship.			Average Steaming days per mensem.		Average repair days per mensem.	
			D.	H.	D.	H.				D.	H.	D.	H.
P.S. 1	..	..	10	5	5	4	P.S. 50	..	..	12	0	3	17
P.S. 2	..	..	11	2	4	22	P.S. 51	..	..	11	8	6	8
P.S. 3	..	..	11	11	4	5	P.S. 52	..	..	12	19	5	15
P.S. 4	..	..	11	15	3	6	P.S. 53	..	..	12	16	6	1
P.S. 5	..	..	10	4	8	11	P.S. 54	..	..	13	13	7	12
P.S. 6	..	..	10	10	8	8	P.S. 55	..	..	11	1	6	6
P.S. 7	..	..	11	9	7	20	P.S. 56	..	..	9	16	8	4
P.S. 9	..	..	12	17	5	11	P.S. 58	..	..	9	13	7	0
P.S. 11	..	..	11	1	6	20	P.S. 59	..	..	16	13	4	0
P.S. 12	..	..	12	1	4	17	P.S. 60	..	..	10	16	5	4
P.S. 14	..	..	12	2	5	16	P.S. 61	..	..	14	9	6	21
P.S. 15	..	..	10	23	5	13	P.S. 80	..	..	15	11	2	21
P.S. 16	..	..	9	17	7	14	P.S. 81	..	..	12	14	3	22
P.S. 17	..	..	10	15	5	3	P.S. 82	..	..	11	19	3	17
P.S. 18	..	..	10	4	4	18	P.S. 83	..	..	13	20	1	11
P.S. 19	..	..	9	19	5	9	P.S. 84	..	..	12	9	5	3
P.S. 20	..	..	12	11	7	5	P.S. 85	..	..	10	15	9	2
P.S. 21	..	..	10	10	1	23	P.S. 86	..	..	10	19	10	9
P.S. 22	..	..	11	1	7	1	P.S. 87	..	..	12	2	6	15
P.S. 23	..	..	11	20	6	17	P.S. 88	..	..	12	8	3	21
P.S. 24	..	..	9	22	12	9	P.S. 89	..	..	11	8	8	3
P.S. 25	..	..	15	3	6	17	P.S. 91	..	..	11	10	3	12
P.S. 26	..	..	11	7	4	10	P.S. 92	..	..	12	2	4	13
P.S. 27	..	..	11	8	5	2	P.S. 93	..	..	12	11	4	20
P.S. 28	..	..	11	1	9	12	P.S. 94	..	..	12	2	8	5
P.S. 29	..	..	11	16	4	22	....		..			..
P.S. 36	..	..	..		13	8	P.S. 96	..	..	11	1	3	21
P.S. 37	..	..	10	3	12	8	T. 2	..	..	9	15	6	17
P.S. 38	..	..	10	12	6	20	T. 3	..	..	9	5	6	2
P.S. 39	..	..	11	13	5	2	T. 4	..	..	10	8	4	18
P.S. 40	..	..	9	17	4	19	T. 7	..	..	13	8	3	4
P.S. 41	..	..	10	16	2	12	T. 8	..	..	15	21	4	22
P.S. 44	..	..	10	3	3	2	T. 9	..	..	11	17	5	2
P.S. 49	..	..	9	13	3	16	T. 11	..	..	12	15	4	7

APPENDIX C (5) - *contd.*

Ship.				Average Steaming days per month.	Average repair days per month.	Ship.				Average Steaming days per month.	Average repair days per month.
				D.	H.					D.	H.
T. 15	..	..	..	13	13	T. 66	..	..	..	11	19
T. 20	..	..	..	15	23	T. 68	..	..	..	16	9
T. 21	..	..	..	13	4	T. 82	..	..	..	12	1
T. 22	..	..	..	12	21	T. 86	..	..	..	12	20
T. 24	..	..	..	11	0	T. 87	..	..	..	14	1
T. 25	..	..	..	11	5	Bamashir	..	..	..	12	1
T. 27	..	..	..	12	8	B. Lynch	..	..	..	16	2
T. 29	..	..	..	12	7	Malmin	..	..	..	15	2
T. 30	..	..	..	12	13	Majedieh	..	..	..	15	13
T. 37	..	..	..	13	0	Salin	..	..	..	13	15
T. 64	..	..	..	13	14	Shihab	..	..	..	11	13

APPENDIX C (6).

Comparative Statistics of Ton-mileage and capacity of Fleet in November 1916 and November 1917.

				November, 16th, 1917.	November 24th, 1917.	Rates.
Ton-mileage	..	..	..	1,916,414	6,603,208	1 to 3.44
D. W. carrying capacity of fleet	..	..	..	23,827	78,062	1 to 3.27
D. W. capacity ships only	..	..	..	3,672	8,346	1 to 2.27
D. W. capacity of barges	..	..	..	20,155	69,716	1 to 3.45
Number of towing ships	..	..	..	68	135	1 to 1.98
Number of cargo barges	..	..	..	93	301	1 to 3.23
Number of cargo ships	..	..	..	57	107	..

Towing Ships.

P.S.	T.	P.T.	S.T.	S	Total.
45	22	0	0	1	68
67	45	11	6	6	135

Cargo Ships.

P.S.	S.	M.L.	S.B.	Total.
34	8	15	0	57
62	18	15	12	107
Rates of towing ships to towing barges				..
..				1916 1 to 1.36
..				1917 1 to 2.22

APPENDIX D (1).

PORT TRAFFIC DEPARTMENT.

Statement of tonnage discharged from sea-going ships.

Period		Tons Deadweight.					
Month ending	30th November 1916	..	..	..	..	..	61,214
"	31st December 1916	..	..	..	..	..	61,123
"	31st January 1917	..	..	..	..	..	79,085
"	28th February 1917	..	..	..	..	..	93,699
"	31st March 1917	..	..	..	..	..	98,073
"	30th April 1917	..	..	..	..	..	98,673
"	31st May 1917	..	..	..	..	..	90,504
"	30th June 1917	..	..	..	..	..	86,303
"	31st July 1917	..	..	..	..	..	78,970
"	31st August 1917	..	..	..	..	..	109,613
"	30th September 1917	..	..	..	..	..	91,251
"	31st October 1917	..	..	..	..	..	108,852
"	30th November 1917	..	..	..	..	..	112,503
"	31st December 1917	..	..	..	..	..	104,593

APPENDIX E (1).
ROLLING STOCK (LOCOMOTIVES).
January 1918.

Gauge.							Number of Locomotives.	Type.	
Metre Gauge	..	..	..	..	..	..	88	4-6-0	11
								0-6-0	71
								4-4-0	1
								0-4-0	5
									88
2' 6" Gauge	..	..	..	..	..	..	25	0-4-2	25
4' 8½" Gauge	..	..	..	..	..	..	31	2-8-0	7
								2-6-0	3
								0-6-0	21
									31

APPENDIX E (2).
ROLLING STOCK (CARRIAGES AND WAGONS).
January 1918.

Description of Vehicles.	Metre Gauge.	2'-6" Gauge.	4'-8½" Gauge.	REMARKS.
Brake Vans	59	4	..	(18 converted to ambulance vehi- cles.)
Covered Goods	791	20	72	
Open Trucks (four wheelers) ..	656	10	256	
Open Trucks (Bogie)	119	107		
Open Trucks (Bogie), crated	96	..	..
Rail Trucks open	114	..	4	
Rail Trucks open, bogied	14	..	..
Double Firsts	29	..	..
Thirds	90	}	9	
Reserved Carriages	14			..
Kitchen Cars	1	..	..
Insulated Cars	6	..	..
Refrigerator Cars	3	..	..
Disinfectant Cars	4	..	..
Store Vans	10	..	..
Cranes	6	..	..
Water Tanks	53	..	4	
Water Tanks (Travelling) Bogie for Armour- ed train.	2	..	..
Ambulance Cars, Bogie	37	..	..
Accident Vans	4	..	..
Fuel Oil Tanks	2	..	..
Armoured Trucks	15	..	..
General Service Trucks .. .. .	..	137	..	
Total	2,125	278	346	

APPENDIX E (3).

Shaiba Workshops.

<i>Description.</i>	<i>No.</i>
Engine Wheel Lathes	1
Carriage and Wagon Wheel Lathes	1
Lathes	13
Drilling Machines	6
Planers and Shapers	4
Slotters	1
Milling and Screwing	2
Grinders	5
Presses	1
Saws (Metal)	2
„ Band (Wood)	1
Cupola (1-ton capacity)	1
Crucible Furnaces, brass	2
Hammers, 5 cwt.	1
„ 150 lbs.	1
Nut and Bolt Machine	1
Blacksmiths Hearths	5
Coppersmiths Hearths	3
Furnace (hardening)	1
Plate Rolls	1
Punching and Shearing	1
Spring Furnace	1

Knit Workshops.

Engine Wheel Lathe	..	..	..	..	..	..	..	1
Lathes ..	..	..	..	..	..	..	..	6
Drilling Machines ..	..	..	..	..	..	..	..	5
Planers and Shapers	..	..	..	..	..	..	..	3
Screwing ..	..	..	..	..	..	..	..	1
Grinders ..	..	..	..	..	..	..	..	5
Saws (metal) ..	..	..	..	..	..	..	..	1
Hammers, 75 lbs.	..	..	..	..	..	..	..	1
Spring Furnace ..	..	..	..	..	..	..	..	1
Blacksmiths Hearths	..	..	..	..	..	..	..	1
Punching and Shearing	..	..	..	..	..	..	..	2

Baghdad Workshops.

Lathes ..	..	..	..	..	..	..	..	\$
Drilling Machines ..	..	..	..	..	..	..	..	3
Planes and Shapers ..	..	..	..	..	..	..	..	2
Punching and Shearing ..	..	..	..	..	..	..	..	1

APPENDIX E (4).

SHED EQUIPMENT.

Magil.

<i>Description.</i>							No.
Lathes .. .. .	..	..	..	..	..	..	2
Blacksmith Hearths	..	..	..	..	..	..	2
Circular Saw 48" ..	..	..	..	..	..	..	1
			<i>Amara.</i>				
Lathes (Hand-power)	..	..	..	..	..	..	1
			<i>Hinaidi.</i>				
Lathes (Hand-power)	..	..	..	..	..	..	1
			<i>Baquba,</i>				
Lathes (Hand-power)	..	..	..	..	..	..	1
			<i>Baghdad.</i>				
Drilling Machines ..	..	..	..	..	..	..	1

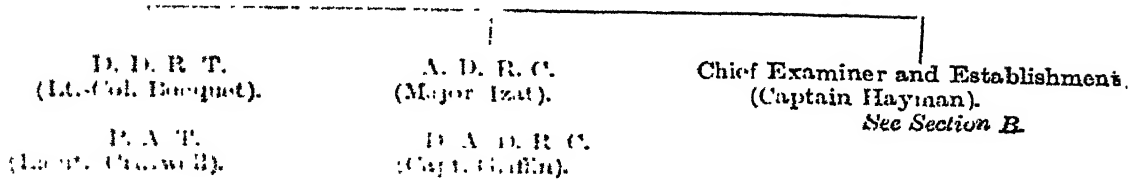
APPENDIX F (1).

Presented under the name of Personnel (Officers).

SECTION A.

Direction and Management.

Director .. (Brig.-Genl. G. Lubbock).
Colonel Oakes. (*Offg.*).

*Deputy Director of Railways, Basra.*

(Col. Oakes, *Offg.* D. R.)
Major Munro, *Offg.*

Sanction 7 Officers.

A. D. R. Establishment
at 1000000.
Lt. Col. H. Lam.
Personal Asst.
Lt. Pedlar.
Lt. Ross.

D. A. D. R.
Construction & Stores.
Vacant.
Capt. Moss, *Offg.*
Personal Asst.
Vacant.

D. A. D. R.
Running.
Vacant.

Assistant Director of Railways, Kut.

Sanction 2 Officers.

Major Kinloch.

Lt. Baker Personal Assistant.

Assistant Director of Railways, Baghdad.

Sanction 2 Officers.

Major Berkeley.

Vacant Personal Assistant.

SECTION B.

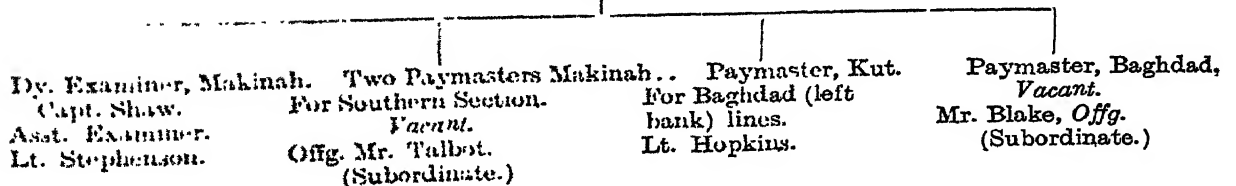
PAY, ACCOUNTS AND AUDIT.

Examiner of Accounts.

Sanction 8 Officers.

Capt. Hayman.

Asst. Examiner.

Vacant.

SECTIONS C AND D.

STORES DEPARTMENT.

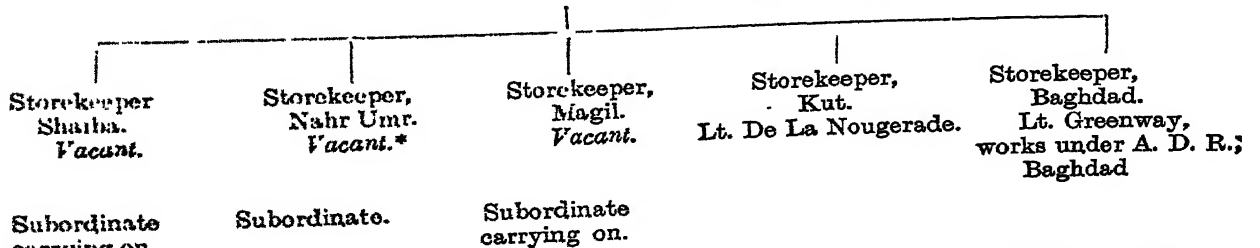
Chief Storekeeper.

Sanction 7 Officers.

Major Angell.

Personal Assistant

.. Capt. Muirhead. (On leave.)
Lt. O'Donovan. (*Offg.*).



RIVER LOADING AND UNLOADING DEPARTMENT.

Sanction 3 Officers.

*Lieut. Doog.
2 *Vacant.*

SECTION E.

ENGINEERING DEPARTMENT MAINTENANCE.

Supdt., Way and Works.
Major Gracey.

Personal Assistants.
Major Kent.
Lt. Holland.

Sanction.
1 Supdt., Way and Works.
8 District Engineers.
21 Assistant Engineers.

D. E., Makinah.
Major Fraser.
Asst. Engineers.
Capt. Parry Jones.
Capt. Byrde.
Lt. Hardinge.

D. E., Qurna.
Major MacIntosh.
Asst. Engineers.
Capt. MacKinnon.
Lt. Bell.
Lt. Morrison.

Workshop Engineer.
Major Cole.
Lt. Bouth.

Miscellaneous Work.

ENGINEERING DEPARTMENT MAINTENANCE.

A. D. R., Kut.

Major Kinloch }
Personal Assistant. } See Section A.
Lt. Baker.

Sanction :
5 District Engineers.
7 Assistant Engineers.

Dist. Engr., Kut.
Capt. Salberg.

Dist. Engr., Aziziye.
Capt. Mairden.

Asst. Engineer.
Lt. Flower.

Dist. Engr., Hinaidi.
Capt. Cookson.

Asst. Engineer.
Lt. Carr.

Dist. Engr. Baquba-Sharhan.
Major Burn.

Asst. Engineer.
Lt. Holt.
Lt. Stevenson.

Special duty.

Lieut. McIntosh. (Temp. attached for 3 months.)

A. D. R., Baghdad.
Major Berkeley }
Personal Assistant. } See Section A.

Sanction :
3 District Engineers.
8 Assistant Engineers.

Vacant.

Dist. Engineer, Baghdad.
Capt. Rosher.

Asst. Engineers.
Capt. Mainprice.
Capt. Mitchell.

Dist. Engr., Feluja Extension.
Capt. Bowen.

Asst. Engineers.
Lt. Butcher.

Musciyib Extension.
Not yet opened.

SECTION F.
Engineering Department Construction Branch.

75

Particulars.	SANCTIONS Dist. and Asstt. Engrs.	Actuals.	Where employed.	Administrative Officer under whom employed.	REMARKS.
No. 1 Construction Company ..	2	Captain Watkins Lieutenant Sheridan.	Kut-Humath Railway .. Raising and packing line in low places	A. D. R. Kut ..	Officers employed on Construction but not posted to Companies.
No. 2 Do. ..	2	Captain Hitchcock Lieutenant Sanders.	Do. ..	Do. ..	Captain Glanville, B. Q. Railway, under S. W. W. Lieutenant Green, Captain Burns. Lieutenant Wishart.
No. 3 Do. ..	2	Not yet formed ..	..	..
No. 4 Labour Company ..	2	Lieutenant Mohamed Zaman (on leave). Vacant.	..	....	Captain Lincoln, Musyib Extension under A. D. Railways Baghdad
No. 5 Do. ..	2	Captain Krieser .. Lieutenant Robertson.	Baqubah-Shahraban Railway .. Raising and packing line in low places	Do. ..	Lieutenant Izat extension under A. D. Railways, Baghdad.
No. 7 Construction Company ..	2	Not yet formed ..	..	..
No. 8 Do. ..	2	Do.	..	..
No. 9 Labour Company ..	2	Do.	..	..
Bridging ..	5	Major Rothera .. Captain Novis. Lieutenant De La Nougereade. Captain Lakeland.	Basrah System Shafi .. Gurnat Ali, Diyalah ..	S. W. W. A. D. R. Kut.	
Surveys ..	3	Captain Creedy .. Captain Glover .. Lieutenant Macfadden .. Lieutenant Malet (on leave)	Baqubah Qizil Robat Survey .. Sharaban Qizil Robat Survey .. Amara Surveys.	A. D. R. Kut. S. W. W.	
Buildings ..	3	Captain Macfarlane Lieutenant Nickers Captain Olliff-Lee	Makinah. Employed on deep well boring Shailba Baghdad.	S. W. W. A. D. R., Baghdad.	
Special for Oil Fuel ..	8	All vacant ..	11 vacancies ..	..

SECTION G.

LOCOMOTIVE DEPARTMENT.

Sanction 25 Officers.

Locomotive Superintendent, Shaiba, Lieutenant-Colonel Thorpe.

On special duty 2nd
February 1918,
Major Porteous,
acting.

Deputy Locomotive Superintendent.

Mr. Wrench.
 Captain Jackson.
 Lieutenant Wallace.
 Lieutenant Cowan (on leave).
 Lieutenant Lloyd.
 Lieutenant Whitby. (Just joined 9th February 1918)

D. L. O. Amara.
Lieut. Meehan.D. L. O. Magil.
Major Bigg-Wither.
Lieut. Scotter.D. L. O. Kut.
Capt. Cunningham.3 Special for oil fuel.
*Vacant.*A. L. O. Hinaidi.
Lieut. Cleary.A. L. O. Baqubah.
Lieut. Fletcher.A. L. O. Kut.
Lieut. Shortt.
Lieut. Carlow.

BAGHDAD RIGHT BANK LINES.

*Loco Superintendent.**Attached Officers.*

Major Ferry.

Capt. Challoner.

Lieut. Wharton.

Lieut. Ingoldby.

Lieut. Carr-Archer.

Lieut. James.

SECTION H.

TRAFFIC DEPARTMENT.

Sanction 15 Officers.

Traffic Manager, Lieut.-Col. Bliss.

Dy. Traffic Manager, Major Hawkes.

Personal Asst. Lieut. Dodge.

*One vacant.*D. T. S. Makinah.
Makinah to Nasiriyeh.
Makinah to Nahr Umr.
Captain Hunter.D. T. S. Nahr Umr.
Nahr Umr to Amara.
Lieut. Coates.A. T. S. Nahr Umr.
Lieut. Corden.D. T. S. Hinaidi.
Kut-Hinaidi.
Hinaidi-Baqubah-
Table Mount.
Capt. Nicolls.A. T. S. Hinaidi.
Lieut. Webb.
A. T. S. Hinaidi.
Lieut. Elkins.A. T. S. Kut.
Capt. Hudson-Heaven.A. T. S. Baqubah-Table Mount.
Lieut. Sheat.D. T. S. Baghdad.
Adv. Base-Fellujah.
Adv. Base-Baghdad-Sudayah.
Captain Blackwood.A. T. S. Baghdad.
Lieut. Nagel.A. T. S. Adv. Base-Fellujah.
Lieut. Simms.*

* In Hospital.

SECTION "I."

Sanction 6 Officers.

Railway Depôt and Administrative and Sanitary Establishment for Shaiba and Makinah Camps.

Camp Commandant.

Capt. Stowell.

Shaiba.
Lieut. Barton.Makinah Depôt.
Lieut. Hay.
2 *Vacant.*Makinah.
Vacant.

RAILWAY TRANSPORT.

A. D. R. T. Major Smith

Personal Assistant.

D. A. D. R. T.
Kut Section.
Capt. Heckroodt.D. A. D. R. T.
Baghdad Section.
Capt. Anderson.R. T. O.
Kut.
Lt. Thornilly.R. T. O.
Hinaidi.
Lieut.
Brookhouse.R. T. O.
Baqubah.
Lieut.
Bolster.R. T. O.
Adv. Base.
Lieut. Leslie.R. T. O.
Felujah.
*Vacant.*R. T. O.
Sadiyah.
Lieut.
Leach.R. T. O.
Belad.
Lieut.
Howgill.R. T. O.
Samarra.
Lieut.
Johnstone.R. T. O.
Amara.
Capt. Moore.R. T. O.
Qurna.
Lt. Thrupp.R. T. O.
Nahr Umr.
Lts. Mitchell
and Horne.R. T. O.
Makinah.
Capt. Moore.
Capt. Hoare
(sick).R. T. O.
Magil.
Lt. Foreman.

APPENDIX F (2).

REORGANISATION SCHEME.

Director's Office.

	D. R.	D. D. R.	A. D. R.	P. A.	Personnel and Mily. questions.	Audit.	Total.
For Management ..	1	..	..	1	..	..	2
For Engineering and Stores.	..	1	1	1	..	..	3
For Transportation ..	..	1	..	1	..	..	2
For Mechanical Work ..	..	..	1	1	..	..	2
For Personnel ..	..	..	..	..	1	..	1
For Audit ..	..	..	..	..	..	2	2
Total ..	1	2	2	4	1	2	12

New Construction.

For Engineering ..	..	..	..	..	..	..	35
Add sickness and leave ..	..	..	..	..	..	..	8
For personnel questions ..	..	..	..	..	..	..	5

APPENDIX F (2).
REORGANISATION SCHEME.
Baghdad Division.

	DIVISIONAL SUPERINTENDENT'S OFFICE.				District Superintendents.	Assistant Superintendents.	Total.	REMARKS.
	Divisional Superintendent.	Superintendent.	Assistant Superintendent.					
For Management	1 D. D. R. . .	..	1 P. A. ..	..	..	.....	2	
For Engineering Work .. .. .	..	1 (A. D. R.)	2 (1 D. A. D. R.) (1 P. A.).	1 Left Bank.	..	{ 1. Kut. 1. Hinaidi 1. Baquba 1 Special new work	14	
				1 Right Bank.	..	{ 2 Baghdad 2 Khurr 1 Special new work.		
For Transportation Work .. .. .	..	1 (A. D. R.) ..	2 (D. A. D. R.) (1 for R. T. O. estimate.)	..	..	{ 1 Kut 1 Hinaidi 1 Table Mountain 1 Baghdad 1 Fula 1 Hilla 1 Kut 2 Baghdad 1 Hinaidi 1 Narrow Gauge	9	
For Mechanical Work .. .. .	..	1 (A. D. R.)	1 P. A. ..	..	..	..	7	

passengers and goods between Basra and Nasiriyeh. The latter amounts on the average to about 5 wagons daily, sometimes more, sometimes less, as military requirements permit. It consists in the up direction (to Nasiriyeh) chiefly of food grains and other necessities of life for the large towns on or near the Euphrates, *e.g.*, Kerbela, to which it is carried on from Nasiriyeh either in country craft or by caravan across the desert. In the down direction there is no "paying" traffic. Sheep and goats belonging to Arab merchants are carried, but these are for consumption by the Army and are taken over on arrival at Basra at prices prevailing at Nasiriyeh, both owner and live stock being carried on a free pass. See Appendix G. (2).

Traffic in live stock is also carried between Baquba and Baghdad.

As regards this traffic it may be mentioned that Nasiriyeh and Baquba are both places where sheep and goats are available in large numbers and they cannot be marched to Basra or Baghdad respectively because neither grazing nor water is available *en route*. That the permission to utilize the railway for commercial traffic is appreciated is shown by the keen competition that takes place for the 5 wagons from Basra to Nasiriyeh.

193. There is no doubt that the use of the railway for the public carriage of passengers and goods is a great influence for good in pacifying and settling the country, and we are of opinion that as facilities improve and opportunities offer this should be gradually developed.

In view of the almost negligible proportion which this class of traffic bears to military traffic, it certainly cannot be said that commercial traffic is carried to an undue extent.

6. JOINT WORKSHOPS.

194. After visiting the port of Basra and up-river stations and with the knowledge obtained of the considerable areas these occupy, we have no hesitation in stating that a joint system of workshops would be impracticable. No economy in personnel or material would be obtained.

In Basra the Inland Water Transport require their workshops near the dock-yard, which is not connected with the railway nor easily accessible; the same holds true as regards their present re-erection yard to a lesser degree.

The railway workshops are situated at Shaiba, 16 miles away from the dock-yard or the R. E. Field Park, Basra; the latter is some distance from the dock-yard.

Approximately the same conditions exist at all up-river stations.

195. Any joint system of workshops would necessitate control by an officer capable of deciding priority of requirements and could not be conveniently sited for these three Directorates so that delay in meeting demands would be entailed and additional transport would be required. The same difficulties apply in the establishment of joint foundries. Work in existing foundries is now carried out from rough sketches amplified by verbal instructions, and if foundries were centralized it would mean preparation of working drawings which would have to be made by each indenting officer, necessary drafting staff for which does not exist.

196. In respect of the manufacture of a commodity in common use by all Directorates and requiring to be distributed from definite centres, centralization might in some instances be advantageous. Thus one Directorate would arrange to undertake the manufacture of bricks for the use of all Directorates; this we understand is being arranged for in the Baghdad area and we recommend it be extended if possible.

7. GENERAL STORES.

197. The following Directorates indent on India for stores :—

Ordnance.

Works.

Inland Water Transport.

Railways.

Present system
of indenting for
Stores.

APPENDIX F (2).

REORGANISATION SCHEME.

Basra Division.

80

DIVISIONAL SUPERINTENDENT'S OFFICE.				District Superintendents.	Assistant Superintendents.	Total.	REMARKS.
Divl. Superintendent.	Superintendent.	Assistant Superintendent.					
For Management	1 D. D. R. ..	..	1 P. A. ..	..	....	2	
For Engineering work	2 (1 D. A. D. R). (1 P. A.).	1 Makina ..	1 Nasiriyeh ..	16	
		1 Makina ..	1 Makina ..		
		1 Makina Shops..	1 Makina Shops..		
		1 Shaiba	1 Shaiba		
		1 Light Railway	1 Light Railway		
For Transportation Work	1 Nahr Umar.	2 Special New Works ..	2 Special New Works ..	7	
		1 Amara ..	1 Amara ..		
		1 Nahr Umar	1 Nahr Umar		
		1 Gurmat Ali	1 Gurmat Ali		
		1 Special New Works ..	1 Special New Works ..		
For Mechanical Work	2 Makina	2 Makina	9	
	2 Nahr Umar..	2 Nahr Umar..		
	1 Makina	1 Makina		
For Engineering work	1 Makina ..	3 1 Nahr Umar	3 1 Nahr Umar	9	
		1 Amara	1 Amara		

APPENDIX F (2).
REORGANISATION SCHEME.

Summary.

—	D. R.'s office.	Basra Division.	Baghdad Division.	For New construc- tion. 6	For Leave and sickness.	Total.	Present Establish- ment.
For Management ..	2	2	2	..	..	6	16
For Engineering ..	3	16	14	35	15	83	88
For Transportation ..	2	7	9	..	4	22	15
For Mechanical work ..	2	9	7	..	4	22	25
For Stores and River unloading.	..	6	3	..	1	10	10
Total Technical Staff	9	40	33	35	24	143	154
For Personnel and Mili- tary questions.	1	11	5	5	..	22	..
For R. T. O., Establish- ment.	..	6	10	..	..	16	15
For Audit work ..	2	4	2	..	..	8	8
Grand Total ..	12	61	52	40	24	189	177

APPENDIX F (3).

Effective strength for week ending 29th December 1917.

	HEADQUARTERS.			ACCOUNTS.			ENGINEERING.			Loco.			TRAFFIC.			STORES.			DEPT.
	Basra.	Kut.	Bagh- dad.	Basra.	Kut.	Bagh- dad.	Basra.	Kut.	Bagh- dad.	Basra.	Kut.	Bagh- dad.	Basra.	Kut.	Bagh- dad.	Basra.	Kut.	Bagh- dad.	
<i>Military.</i>																			
British Officers ..	2	..	4	1	1	..	12	8	8	3	1	4	1	3	2	..	1	..	2
W. Os. ..	1	..	1	1	..	..	..	1	..	..	..	..	..	..	..	1	..	..	..
O. Rs. ..	24	2	9	1	..	..	36	43	97	120	78	119	51	47	55	3	8	2	10
Os. ..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..
O. Rs. ..	2	..	..	..	..	..	..	1	..	..	1	17	..	1	..	14	..	..	16
<i>Civilians.</i>																			
Officers ..	1	1	2	..	..	1	10	6	3	5	5	1	4	2	2	2	..	1	..
Workers ..	8	5	24	42	5	10	80	28	12	82	25	13	58	18	7	108	6	16	3
Reported skilled labour ..	..	..	..	..	..	..	1,253	291	106	1,027	451	112	466	244	141	653	8	6	..
Reported Unskilled labour	17	4	38	14	2	5	5,891	3,404	1,521	726	455	102	197	97	91	1,115	76	26	152
<i>Local Labour.</i>																			
Against War Establishment	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Skilled local labour outside War Establishment.	..	..	..	2	..	..	22	3	95	25	49	125	2	..	42	..	..	..	..
Unskilled local labour outside War Establishment.	..	..	..	..	..	..	783	..	740	8	3	108	..	..	27	..	..	..	..

APPENDIX F (1).

Statement by trades of rejections of skilled labour showing percentage of each trade.

Trade.	Arrivals since 11-9-17.	Rejections* since 11-9-17.	Percentage.
Permanent Way Inspectors	12	5	41·7
Assistant Station Masters	85	2	2·4
Loco. Inspectors	2	1	50·0
Boilermakers	103	9	8·7
Machinemen	21	1	5·0
Turners	26	3	11·6
Loco Blacksmiths	40	2	5·0
Engine Fitters	88	12	13·7
Carriage Fitters	72	1	1·4
Firemen	259	2	0·8
Shunters	13	1	8·0
Guards	71	1	1·4
Signallers	49	1	2·0
Letter Painters	2	1	50·0
Draughtsmen	20	7	35·0
Surveyors	6	1	16·7
Clerks	178	14	7·8
Timekeepers	17	1	6·0
Sub-Overseers	14	1	7·1
Total ..	1,078	66	6·1

*This figure of course includes repatriations of men who arrived before 11th September 1917 but were repatriated after that date.

APPENDIX F (5).

MESOPOTAMIAN RAILWAYS.

Statement giving three-monthly total number of locally engaged skilled labour during 1917.

Quarter ending 31st March 1917	Nil.
Quarter ending 30th June 1917	542
Quarter ending 30th September 1917	1,125
For October and November 1917*	1,270

*Figures for December not yet available.

APPENDIX G (1).

Mesopotamian Railways.

	Tons carried.	Ton miles.	No. of wagons used.	Average wagon load.	Loaded wagon miles.	No. of trains.	Total train miles.	Average No. of wagons per train.	Load tons ex Basra.	Tons carried.	Ton miles.	No. of loaded wagons used.	Average wagon loads.	Loaded wagon miles.	No. of trains.	Total train miles.
January 1918.																
Basra System	77,065	3,648,486	11,820	6	468,660	308	19,502	48	21,178	12,453	320,603	1,593	7	45,017	299	19,783
Kut-Hinadi District	52,333	4,367,294	9,756	5	775,020	299	5,685	36	..	3,825	141,512	740	5	27,286	281	29,216
Baquba-Table Mountain District ..	9,708	287,065	1,593	6	46,951	131	2,794	12	..	2,083	56,033	275	7	7,032	126	2,794
Baghdad-Samarra-Telija Section ..	37,538	2,402,657	..	..	..	..	..	..	..	..	..	..	..	..	..	..

APPENDIX G (2).

Coaching and Goods Earnings for Basra-Qurna-Amara and Basra-Nasiriyeh Sections.

	COACHING.						GOODS.		Total.
	Basra-Qurna-Amara.			Basra-Nasiriyeh Section.			Basra-Nasiriyeh Section.		
	No. of passengers.	Amount.	Rs. A. P.	No. of passengers.	Amount.	Rs. A. P.	No. of wagons.	Amount.	
July 1917	8	400 0 0	Rs. A. P. 400 0 0
August 1917	54	2,700 0 0	2,700 0 0
September 1917	72	3,630 0 0	3,630 0 0
October 1917	2,732	3,887 2 6	1,590½	81	4,110 0 0	21,604 10 6
November 1917	3,019	3,922 11 0	1,962½	133	6,665 0 0	27,840 3 0
December 1917	2,652	3,409 1 0	1,706	187	10,025 0 0	28,097 6 0
January 1918	1,055	3,926 13 0	1,733	126	6,340 0 0	21,614 15 0
Total	..			9,458	15,143 11 6	6,992	661	33,870 0 0	1,05,887 2 6

APPENDIX G (3).

Comparative statement of Tons, Ton Miles, Engines and Rolling Stock.

	Tons.	Ton Miles.	Engines.	WAGONS.		Total.	ROLLING STOCK.		Other Vehicles.	
				Covered.	Open.		Thirds.	Composites.		
<i>Basra System.</i>										
December 1916	24,322	..	..	Information not available in this office.	229	327	556	20	4	107
June 1917	..	755,153	..	..	336	655	991	56	17	144
December 1917	80,331	2,929,685	37	..	..	..	..	..	..	..
<i>Kut-Baghdad Section.</i>										
December 1916	Not	Open	..	..	..	..	..	..	..	..
June 1917	Not	Open	..	..	..	..	..	..	..	..
December 1917	42,837	3,317,337	31	224	430	654	654	38	10	45
<i>2'6" Gauge.</i>										
December 1916	Not	Open	..	..	..	..	..	..	..	..
June 1917	Not	Open	..	..	..	..	..	..	..	..
December 1917	10,231	255,297	16	67	67	67	67	..	..	..
<i>Standard Gauge.</i>										
December 1916	Not	Open	..	..	..	..	..	..	..	..
June 1917	Not	Open	..	..	..	..	..	..	..	..
December 1917	27,229	787,042	..	40	251	291	291	1	..	40

APPENDIX G (4).

LOCOMOTIVE CONDITION STATEMENT.

Corrected up to February 20th 1918.

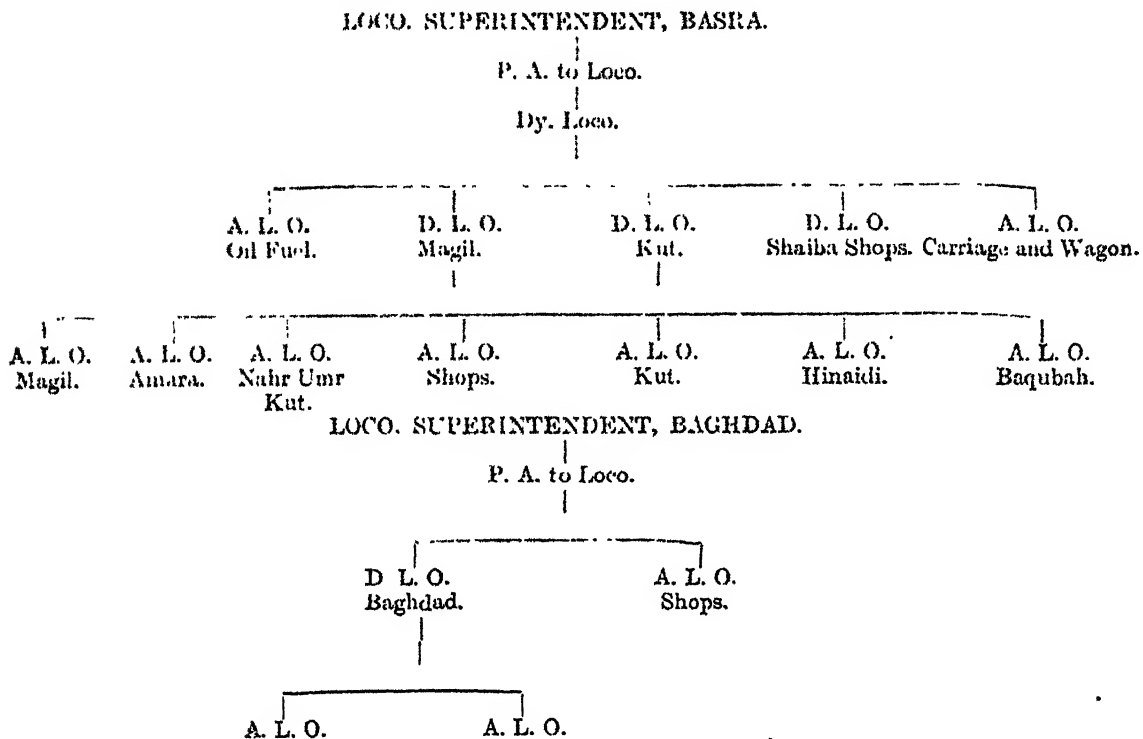
	Metre Gauge.	2' 6" Gauge.	4' 8½" Gauge.
Total Number of Engines	88	25	31
Number of Engines in shops	12	4	7
Number of engines stopped waiting for shop repairs ..	6	<i>Nil.</i>	6
Number of engines still running but overdue shop repairs	14	15	<i>Nil.</i>

APPENDIX G (5).

Note on the Locomotive Department of the Mesopotamian Railways.

There are two Locomotive Superintendents, one for the Metre Gauge 2' 6" lines, headquarters Organisation. at Basra; the other for the 4' 8½" gauge lines, headquarters at Baghdad.

The existing organisation is shown below :--



The sections Basra to Nasiriyeh, Basra to Amara, Kut to Hinaidi, Hinaidi to Baqubah are all metre gauge.

Baqubah to Table Mountain 2' 6" gauge. These are worked under the orders of the Locomotive Superintendent, Basra.

The break in Railway communication between Amara and Kut, a distance of about 150 miles, makes efficient control difficult.

The 4' 8½" lines radiating from Baghdad are worked by the Locomotive Superintendent, Baghdad.

The departmental system is at present in force on both groups but a Divisional Scheme is now under consideration.

Appendix E (1) and E (2) show the rolling stock, locomotives, carriages and wagons, and Rolling Stock. Appendix G. (4) the condition statement of locomotives on both systems.

A perusal of the latter will show how serious the position is as regards Engine Power.

Out of a total of 88 metre gauge engines 18 are stopped and 14 more should be stopped for repairs.

On the 2' 6" line 4 engines out of a total of 25 are stopped and 15 more are still running but should go into shops for repairs.

On the 4' 8½" section 7 engines are in shops, 6 more are stopped waiting for repairs or 13 engines out of a total of 31.

The main locomotive workshops for the metre and 2' 6" gauge lines are at Shaiba 16 miles Workshops. from Basra. They were commenced in September 1917 and are not yet complete and are far too small for the repairs they will have to undertake and are poorly equipped. There are no pits, no overhead cranes, no floors, and the machinery is inadequate and in some cases unsuitable for the work required of them.

There are no Carriage and Wagon Repair shops.

There is a small repair shop at Kut for engines working on the metre gauge sections Kut-Hinaidi-Baqubah and the 2' 6" branch from Baqubah to Table Mountain.

These shops are also inadequately equipped. There are no Carriage and Wagon Repair shops.

At Baghdad there are small repair shops for the 4' 8½" gauge engines. The machinery and equipment are insufficient to deal with the repairs required.

There are no Carriage and Wagon Repair Shops.

Engine Depôts.

There are no running sheds and no pits except at one or two depôts.

What little machinery there is at Engine Depôts except at Magil is not power-driven. The washing-out arrangements are primitive. There is insufficient head of water and as there are no settling tanks, washing out can not have the desired results.

Watering arrangements.

These are by no means satisfactory. Water is obtained from the river and is very muddy, and no attempt appears to have been made to put it in settling tanks.

General.

Whilst it is admitted that under war conditions make-shift arrangements must be made to get a line through as soon as possible ; these should subsequently be made suitable for working traffic. There may have been reasons why this was not possible but the present critical state of the engines can only be attributed to a lack of facilities for repairing engines in workshops and depôts, and the unsatisfactory washing-out and watering arrangements.

APPENDIX II.

Statement of new mileage constructed month by month.

				NEW MILEAGE.				TOTAL MILEAGE CONSTRUCTED.			
				N. G.	M. G.	S. G.	Total.	N. G.	M. G.	S. G.	Total.
1916.											
June	..	..	..	..	12	..	12	..	12	..	12
July	..	..	..	15	18	..	33	15	30	..	45
August	..	..	..	5	20	..	25	20	50	..	70
September	..	..	..	20	15	..	35	40	65	..	105
October	..	..	..	27	32	..	59	67	97	..	164
November	..	..	..	33	28	..	61	100	125	..	225
December	..	..	..	8	15	..	23	108	140	..	248
1917.											
January	..	..	..	10	2	..	12	118	142	..	260
February	..	..	..	<i>Nil.</i>	15	..	15	118	157	..	275
March	..	..	..	<i>Nil.</i>	23	..	23	118	185	..	303
April	..	..	..	<i>Nil.</i>	25	..	25	118	210	..	328
May	..	..	..	<i>Nil.</i>	12	..	12	118	222	..	340
June	..	..	..	20	56	..	76	138	278	..	416
July	..	..	..	16	37	9	62	154	315	9	478
August	..	..	..	<i>Nil.</i>	..	..	..	154	315	9	478
September	..	..	..	18	..	..	18	172	315	9	496
October	..	..	..	9	33	10	52	181	348	19	548
November	..	..	..	6	24	20	50	187	372	39	598
December	..	..	..	<i>Nil.</i>	13	10	23	187	385	49	621
1918.											
January	..	..	..	<i>Nil.</i>	<i>Nil.</i>	<i>Nil.</i>	<i>Nil.</i>	187	385	49	621

This does not include dismantling a total of 166 miles of track 2' 6" gauge.

602 days for 621 miles, or 1.03 mile per day.

NOTE.—Above figures are for track *constructed* and do not include lines taken over from the enemy.

APPENDIX J.

FROM COLONEL E. DICKSON, DIRECTOR OF LOCAL RESOURCES, MESOPOTAMIAN EXPEDITIONARY FORCE, TO THE DEPUTY QUARTERMASTER-GENERAL, GENERAL HEADQUARTERS, MESOPOTAMIAN EXPEDITIONARY FORCE, DATED BAGHDAD, THE 8TH JANUARY 1918.

In view of the very limited time available for arrangements to put in train for dealing with the collection, cleaning and distribution of the forthcoming harvest, I am putting forward the attached memoranda hoping they may be of assistance in deciding some of the problems which inevitably must be tackled in dealing with large tonnages which have to be collected, cleaned, packed and distributed by several different forms of transportation.

Railways.

The necessity, if practically possible, of the main line going to Hillah is quite evident, and requires no further comment.

Light Railways.

A most useful extension of light railways would be —

- (1) To Tuerij.
- (2) To Jerboiyah.
- (3) To Kifl.

Milling.

I have not touched on this question, as I believe the Director of Supplies and Transport has been addressed from your office on the subject.

MEMORANDUM FROM THE DIRECTOR OF LOCAL RESOURCES, TO THE DEPUTY QUARTERMASTER-GENERAL, GENERAL HEADQUARTERS, MESOPOTAMIAN EXPEDITIONARY FORCE, DATED THE 7TH JANUARY 1918.

HARVEST, 1918.

*Distribution of Grain and Fodder Crops.***Crops.**

The First Revenue Officer states that the following will be available for the Force from the grain crops to be gathered in the harvest commencing May 1918 :—

Wheat and Barley—

					Tons.	Tons.
From Revenue payments in kind	..	..	..	..	57,000	
Available for purchase	..	..	..	..	33,000	
						90,000

Bhoosa —

From Revenue payments in kind	..	..	..	..	85,000	
Available for purchase	..	..	..	..	65,000	
						150,000
Total	..	..	..	..		240,000

It is doubtful whether the land, railway and water transport likely to be available in June next will be sufficient to deal with more than the revenue tonnage, but bearing in mind the advantage to be gained by procuring the greatest amount of grain and fodder possible, the suggestions now put forward for consideration are upon the basis of handling the whole of the estimated amount.

As a preliminary to deciding upon a scheme for the taking over of revenue supplies and arranging purchases prior to distribution to the Force, it is necessary to settle upon the points at which revenue grain and fodder is to be received from the cultivators; and, having decided upon these points, to fix upon the more important centres where grain can be cleaned and bagged, and bhoosa pressed into bales prior to transport.

The First Revenue Officer states that he will have granaries at the places named in column (1) below, and that the amount to be received in revenue payments in kind will be approxi-

mately as given in column (2). Cleaning, etc., centres might be established at the places given in column (3) :—

Receiving stations.						Revenue expecta- tions.	Suggested Cleaning centres.
						(In tons.)	
<i>Euphrates.</i>							
Abu Skair	..	..	..	..	..	5,000	Shamiyah. Kufa.
Shamiyah	..	..	..	..	..
Kufa	..	..	..	..	..
Kifl	..	..	..	..	..	10,000	Kifl. Tuerij.
Tuerij	..	..	..	..	..
HindiyeH Barrage	..	..	..	..	..	2,000	HindiyeH.
Kerbela	..	..	..	..	..	500	
Rashadiyah	..	..	..	..	..	1,500	DiwaniyeH.
Shafeiyah	..	..	..	..	..
DiwaniyeH	..	..	..	..	..
Dghara	..	..	..	..	..	5,000	Dghara.
Afej	..	..	..	..	..
Jerboiyah	..	..	..	..	..	9,000	Jerboiyah.
Madhatiyah	..	..	..	..	..	500	Hillah.
Hillah	..	..	..	..	..	2,000	
Muhawil (Inland)	..	..	..	..	..	500	
Iskandriyah	..	..	..	..	..	5,000	Iskandriyah. Museyib.
Museyib	..	..	..	..	..
Mahmoodiyeh (Road)	..	..	..	..	..
Abu Gharaib	..	..	..	..	..	1,500	Feluja.
Radhwaniyah	..	..	..	..	..
Feluja	..	..	..	..	..	500	
Ramadi	..	..	..	..	..
<i>Tigris.</i>							
Kut	..	..	..	..	..	1,500	Kut.
Baghailah	..	..	..	..	..	2,000	Baghailah.
Swera	..	..	..	..	..	1,000	Swera.
Zeur	..	..	..	..	..
Baghdad	..	..	..	..	..	1,500	Baghdad.
Sumaicha	..	..	..	..	..	2,000	Sumaicha.
Beled	..	..	..	..	..

Receiving stations.						Revenue expectations.	Suggested Cleaning centres.
						(In tons.)	
<i>Diala.</i>							
Beled Ruz	..	..	..	..	..	..
Shahraban	..	..	..	..	..
Buhriz	..	..	..	..	..
Khan Beni Sa'ad	..	..	..	..	..
Sindiye	..	..	..	..	..
Deltawah	..	..	..	..	..
<i>Inland.</i>							
Mendali	..	..	..	..	..	6,000	
Zobatiyah	..	..	..	..	..
Bedra	..	..	..	..	..		Baqubah
Jessan	..	..	..	..	..		Beled Ruz.
							Nasiriyeh.
<i>Hai.</i>							
Basrughiyah	..	..	..	..	..
Hai Town	..	..	..	..	..
Total						57,000	

It is likely to be found in practice that additional stations will be necessary and it would be well to provide establishment for five places additional to those named in column (3) above.

Storage accommodation.

Consideration will have now to be given to the storage space necessary for the maximum amount of grain and bhoosa it is estimated will be in stock at any one time, and any deficiency should immediately be remedied by carrying out such temporary constructional work as is required—due regard being had to the probable needs of future harvests. In this connection an important point is the placing of means of ingress and egress at separate points and so designing the accommodation that congestion of traffic will not occur.

The list given on sheets (2) and (3) gives the places at which centres are to be established and I suggest that storage space up to 50% of the maximum revenue expectation should be provided. Any excess of produce procured by purchase would be set off by despatches to main cleaning centres or direct to the Force.

Main despatching centres like Museyib, Tuerij, Hillah, Jerboiyah, Nasiriyeh and Kut should be specially considered in relation to (1) the expected receipts from sub-depôts and (2) the railway, land and water transport facilities forward to the Force. But in any case, very large storage space will be necessary at each place, in order to house and protect bhoosa prior to baling. If the railway is extended to Hillah, storage accommodation should be provided on the opposite bank of the canal to the present Headquarters. Indeed, this would appear to be an advantage in any case, as it would divide the traffic, relieve congestion, and prevent considerable crossing of the narrow bridge over the canal.

A small portion of each main centre should be set apart for the receipt, storage, repair and issue of bags and shaleefs.

A representative of the Director of Works should make a tour of all Depôts, in order that a decision may be arrived at as to the best means of providing any necessary additional accommodation, and of carrying out any minor alterations which will be beneficial to the rapid handling of the grain and fodder.

Labour.

At each granary, there should be a representative who would act as weighman and store-keeper. As the revenue payments are delivered, he could agree with the Revenue Representative the weight of the grain and bhoosa received and see it placed into the store, where he would be responsible for its safe custody. He would also be able to protect Government interests in relation to the cleanliness of the grain and bhoosa offered as payment in kind. This would be

a very responsible post and should not, in my opinion, be entrusted to a native, who would be susceptible to bribery. As the work would be carried out during the season when operations are not likely to be in progress British ranks should be made available for the work.

These weighmen and storekeepers would issue the grain from the receiving points and would way-bill it to the main centres or to railheads, where it could be weighed in and checked. It has been suggested that lead seals should be placed on each bag or shaleef, and this would no doubt be found to be well worth the little extra labour and time involved. These measures would have the effect of checking — if not entirely eliminating — theft by transport men during transit, and, if it becomes necessary, deduction could be made from their pay with certainty as to the amount of grain or bhoosa missing.

Weighmen and storekeepers will also be required at the main centres, railhead, etc. These centres might be divided into sections, each working independently of the other, having its own part of the storage accommodation, its weighing machines, bags, etc. Each section would control its own labour, and would account to the officer in charge of the centre for its receipts and issue and for the work performed in cleaning, bagging and despatch. Slackness in any one section would soon be discovered by comparison of output.

In these sections, supervisors should be appointed to control labour in order to get full value from it, and to see that the organisation is properly worked. These supervisors should be British non-commissioned officers.

An estimate should be obtained as soon as possible of the daily labour which is likely to be required at each of these main centres, so that if the locality is not likely to be able to produce the amount required, timely notice may be given to the Director of Labour in order that he may endeavour to provide what is necessary. In this connection the requirements of the Irrigation Engineer, and of the Director of Inland Water Transport for boat building, should be considered so that labour essential to each may be allotted. The necessities of agriculture should be also considered as it would be unwise to take labour from the land.

Supervisors and workmen will also be required for bhoosa baling apparatus at each selected point, and as experienced workers will be advisable for the first harvest, India should be asked at once to arrange supply. With these there should be employed suitable native labour which could be trained with a view to future harvests.

Bag and shaleef repairers will also be required for each main centre.

Suggestions as to the officers, clerical establishment, interpreters, etc., likely to be required are given in the concluding note. The whole of this staff should be secured in time to enable them to be at their respective stations not later than the end of May next. Really good agents, interpreters and local clerks should be secured, as they will have an important bearing upon the success or failure of the work.

It may be advisable to avoid centralisation as much as possible and in sanctioning the provision of personnel this point should be borne in mind. The handling of large quantities of grain and bhoosa with its consequent heavy land and water transport at one point, does not tend to rapid clearing, and as transport is likely to be the most difficult portion of the scheme, every effort should be made to deal with it expeditiously.

It is important that a uniform system of accounting and way-billing should be carried out at each place and way-bills, forms of accounting, transport orders, etc., should be printed in advance and distributed in suitable quantities to each centre.

No issue of grain or bhoosa should be made from any Dépôt unless the numbers of bags and shaleefs are marked upon the way-bills. The special bag and shaleef section at the main centres should be in charge of a British non-commissioned officer, who ought continually to press for the return to his score of all bags and shaleefs issued. It will only be by some such system as this that very large losses in bags and shaleefs will be averted. Some losses are inevitable, but last year's losses should not be repeated in proportion to the larger quantities to be obtained. The necessity for care of bags, etc., should be impressed upon all ranks, and Supply Dépôts should return grain bags without delay.

The officials responsible for the collection and distribution of the harvest should be empowered to engage locally, armed and mounted Arabs for the patrolling of roads upon which grain and bhoosa convoys are travelling, if it is considered any route is not free from the possibility of raid and theft.

Before the harvest commences, instructions for the guidance of the officers in charge of the various districts should be compiled; particular attention being paid to the methods of accounting for stocks, the payment of locally engaged day labour and the care of public funds.

Cleaning of grain and pressing of bhoosa.—Hand and Power driven winnowing machines may be required as follows:—

								Hand.	Power.
Shamiyah	..	..	..	..	..	..	..	3	..
Kufa	..	..	..	..	..	..	..	3	..
Kifl ..	..	..	..	..	..	..	..	2	2
Tuerij	..	..	..	..	..	..	..	1	..
HindiyeB Barrage	..	..	..	..	..	..	..	1	..
Diwaniyeh	..	..	..	..	..	..	..	3	..
Dgharra	..	..	..	..	..	..	..	2	2
Jerboiyah	..	..	..	..	..	..	..	2	1
Hillah	..	..	..	..	..	..	..	1	..
Iskandriyah	..	..	..	..	..	..	..	2	1
Museyib	..	..	..	..	..	..	..	2	..
Feluja	..	..	..	..	..	..	..	3	1
Kut	..	..	..	..	..	..	..	2	..
Baghailah	..	..	..	..	..	..	..	1	..
Swera	..	..	..	..	..	..	..	1	..
Sumaicha	..	..	..	..	..	..	..	2	1
Baghdad	..	..	..	..	..	..	..	1	..
Beled	..	..	..	..	..	..	..	3	..
Baqubah district	..	..	..	..	..	..	..	4	1
Nasiriyeh	..	..	..	..	..	..	..	36	9
Add for contingencies and for moving from place to place ..								9	..
								45	9

If power driven machines cannot be procured, a further 15 hand machines will be required and in view of the cost of the former it is for consideration whether it would not be advisable to procure hand machines only, though 30 per cent. more local labour is needed.

A small power crushing plant might be installed at Hillah or Museyib to crush barley which is intended for direct issue to Units on the Euphrates.

Bhoosa baling machines may be required as follows:—

Shamiyah	..	..	..	..	..	..	..	..	9
Kufa	..	..	..	..	..	..	..	..	18
Kifl ..	..	..	..	..	..	..	..	..	3
Tuerij	..	..	..	..	..	..	..	..	9
HindiyeB Barrage	..	..	..	..	..	..	..	..	18
Diwaniyeh	..	..	..	..	..	..	..	..	11
Dghara	..	..	..	..	..	..	..	..	1
Jerboiyah	..	..	..	..	..	..	..	..	10
Hillah	..	..	..	..	..	..	..	..	2
Iskandriyah	..	..	..	..	..	..	..	..	3
Museyib	..	..	..	..	..	..	..	..	2
Radhwaniyah	..	..	..	..	..	..	..	..	3
Feluja	..	..	..	..	..	..	..	..	2
Kut	..	..	..	..	..	..	..	..	2
Baghailah	..	..	..	..	..	..	..	..	3
Swera	..	..	..	..	..	..	..	..	2
Baghdad	..	..	..	..	..	..	..	..	3
Sumaicha	..	..	..	..	..	..	..	..	2
Beled	..	..	..	..	..	..	..	..	2
Baquba district	..	..	..	..	..	..	..	..	4
Nasiriyeh	..	..	..	..	..	..	..	..	2
Total								99	

It is suggested that the four bhoosa baling machines to be provided on bargers should be allotted to the Tigris, as full work for stationary machines can be found at the stations on the Euphrates.

The estimated output of a hand winnowing machine with labour working eight hours is 16 tons per day.

The estimated output of a power driven winnowing machine is 24 tons per eight hour day.

Each hand winnowing machine will require 20 men, and each power driven machine 15 men.

A bhoosa baling machine will turn out 200 bales of 80 lbs. weight per day—7 tons, and will require 8 men for labour. Therefore, if 2-3rd of the whole amount of 15,000 tons is baled, viz., 100,000 tons, 100 machines each working 20 days per month will be required for seven months. It would probably be safer to calculate eight months for the same number of machines.

Spare parts for both hand and power machines of all types should be procured and kept at the main centres, together with tools, and a staff of mechanics should also be available, constantly travelling from centre to centre to examine machines regularly and carry out repairs before the condition of machines becomes so bad that complete stoppage is necessary.

The total quantity of 90,000 tons of wheat and barley estimated to be available will require **Bags and Shaleefs.** 2,520,000 bags, representing a tonnage of 2,250. The Director of Supplies and Transport will arrange the provision of these by holding bags in this country, instead of returning them to India. India should, however, be advised of this at once so that stocks may be replenished.

One hundred and forty thousand square yards of hessian, suitable for making shaleefs, should be ordered from India at once. Each camel shaleef requires about 7 square yards and this quantity of hessian will provide 20,000 shaleefs. This number would be sufficient to move about 8,500 tons per month allowing six trips per month. Arrangements should be made for the whole of the revenue bhoosa to be delivered direct to granaries by cultivators, but if this is not possible a greater number of shaleefs will be necessary and transport difficulties will be increased correspondingly.

This material should be delivered in Baghdad, where a contract could be arranged for making shaleefs to pattern, the material and the necessary string being sold to the contractor at cost price. This would ensure his making the best use of the material.

For the sewing of grain bags and shaleefs, 5,000 miles of string will be necessary; 1,430 miles will be needed for grain bags alone, and the balance will certainly be required in the manufacture of the shaleefs and for the stitching after the shaleefs have been filled each time.

One thousand five hundred steel sewing needles will also be required for use at the main centres, and at the receiving depôts.

Six hundred and twenty-five tons of baling wire should be provided. Each bale of bhoosa requires $\frac{1}{2}$ lb. of wire; therefore, the weight of baling wire for one ton of bhoosa is 14 lbs. and for 100,000 tons 625 tons.

Camel transport is likely to be much more useful than Ford Vans, which could not get to some of the receiving points and Depôts. The use of the latter will be restricted to the main roads, but against this there has to be considered the scarcity of animal transport and efforts should be made to make as many routes as possible available for motor vans by road improvements and the strengthening of irrigation culverts.

Camels will have to be used to deal with stocks of grain from the smaller receiving points to the cleaning centres and they should be almost entirely used for the transport of loose bhoosa in order to free water transport for grain. The Revenue Board should, however, insist on all revenue payments being made at a granary, payment for any distance over three miles being made on the usual scale.

A census of the camels available would be useful, and owners should be notified by proclamation issued by the Civil Commissioner that Government will be prepared to hire next June large numbers of animals on regular work at a rate of hire on a tonnage carried basis. Efforts should be made through Colonel Leachman to secure large numbers of camels from the desert Arabs, though there is to be considered the objection of nomad tribes to living near towns.

Assuming that the whole of the 150,000 tons of bhoosa were transported during a period of eight months 19,000 tons per month, 22,000 camels would be required at seven camels to the ton, working six trips per month, but if all revenue bhoosa is delivered to centres by cultivators, much of the camel transport will be saved and only 65,000 tons or 8,000 tons per month for eight months would have to be moved. This would require 9,300 camels. It is assumed that all revenue bhoosa will not be delivered to granaries and therefore a further 5,000 or 6,000 camels will probably be necessary. It might be said that contractors should deliver to centres bhoosa purchased on the open market, but as all transport will be in Government employ it will be probably be necessary to undertake transport, unless it is found desirable to release camels to large contractors.

This takes no account of grain transport.

It is in connection with land transport that the greatest difficulty arises, and it may be said at once that camels to the number estimated above cannot be obtained. It will therefore be economical to get from India large numbers of baling machines and to station them at points along the main waterways and within easy reach of the contemplated line of railway. A percentage of the bales, say 25, could be stored so that that portion may be transported by every available means during the four months not included in the above calculations.

The large number of camels required, emphasises the necessity for the railway and for adequate rolling stock; the fullest amount of river transport and tugs possible, and the assured allotment of the greatest number of motor vehicles which can be worked efficiently and economically.

Notification should be issued to the civil population that all transport will be at the call of the Government and that only such an amount as is considered to be absolutely necessary for trade will be liberated for limited periods, on application being made and the reason therefore stated.

Donkey transport has been left out of consideration as it gives such a poor result that in a scheme of this kind it is hardly worth the labour involved. Furthermore, it will be required by cultivators for bringing in their harvest to the receiving points.

The greatest amount of river transport which can be made available will not be too much to meet requirements, and the Director of Inland Water Transport should be asked to at once register and control all the boats on the Euphrates, if this has not already been done. It may be necessary also to transfer boats from the Tigris to the Euphrates during July to December.

On the assumption that the Revenue Board will be able to get in 75 per cent. of the revenue grain and bhoosa during the months of July, August and September, and that contracts for the purchase of grain will be arranged during the same period, it will be necessary to obtain the services of transport as follows :—

Camels.—The largest number obtainable up to 15,000.

Ford Vans.—1,100 (or more if available). These would be used as feeders to rail and river. Allowing 100 always out of action, 1,000 at 5 cwt. per load working a district which would permit a return trip in eight hours, would move 250 tons per day. Say, for a margin of safety 1,300 tons per week.

Peerless Lorries.—If these are likely to be available I suggest the Assistant Director of Transport (M.T.) be asked to report whether they could not be worked with advantage between Jerboiyeh and the railway terminus at Hillah in order largely to relieve the water transport on the Hillah Canal. In this connection, widening of the canal bridge at Hillah should be considered.

Mahelas, etc., and Tugs.—The largest number procurable properly distributed and organised will not be too many, but it is imperative that tugs should be available if the full benefit of water transport is to be obtained. If the Director of Inland Water Transport confirm that it is possible, shallow-draught tugs should be employed on the Hillah Canal, for rapid movement on this stretch is necessary if the large amount of grain and bhoosa expected is to be secured, bearing in mind the fact that the canal is of necessity frequently out of action due to diversion of the water.

These estimates are based on the assumption that the railway will be constructed from Baghdad to Museyib and Hillah. If the railway is not constructed the quantity of produce estimated cannot be transported.

If there is not sufficient permanent way to construct the railway to Hillah *via* Museyib, it would be better to take it direct to Hillah by way of Mahmudiyah, Iskandriyah and Mahawil, as this route would tap a number of canals in the areas of which considerable crops are expected.

If there is any Decauville line available it would be of the utmost value in collecting crops in the districts in which the larger results are expected. A light railway would be particularly useful from Jerboiyah to Hillah and, if the Railway does not touch Museyib from Hindiyyeh Barrage to the nearest point of the railway line. In any case the greatest amount of line available could be utilised.

Fast shallow-draught launches should be procured for the use of the officers and supervising staff, particularly at and below Hillah, for unless rapid means of locomotion are supplied, large personnel will be needed. It is particularly important that these boats should be enabled to travel along the main canals and their larger branches.

Weighing machines.

Weighing machines will be required for use at every receiving Depôt, the number varying according to the produce expected.

It is estimated that 200 will be necessary in addition to those already in use by the Revenue Board, and enquiries should now be made as to the possibility of these being manufactured in this country.

Control of prices.

It might be well if the Civil Commissioner let it be known throughout the occupied territory that revenue payments in kind and the delivery of the Government share must be made immediately on completion of the harvest, and certainly not later than August 31st, and strong pressure should be brought to bear on cultivators and others to ensure this. If this is accomplished, it will enable us to keep off the market for a good period, except in a small quiet way, and would probably have the effect of forcing down the market rate to the civil population.

We should also profit by the experience of last year and energetic measures should be taken to prevent merchants obtaining big stocks and holding them in order to force up prices. This could probably only be done by compelling known holders of large quantities to sell at a fixed rate, and, on refusal to sell at that rate, to penalise them by commandeering up to 60 per cent. at 10 per cent. below market price. As an alternative, we might continue to ration Baghdad as at present and forbid merchants to trade on the Euphrates until after the requirements for the force for one year had been fully secured. This, however, would add to the transport difficulties, and it is inadvisable to hinder the normal flow of trade; but whatever course is decided upon should be made known to the community not later than March next, so that merchants who contemplate purchasing and holding stocks may know what Government intentions are

No emptying of the Hillah Canal should be permitted without agreement as to dates having Hillah Canal. first been reached with the Inland Water Transport, otherwise the work at Hillah and other points on the canal may be seriously disorganised. The rotation of water in the two streams should be similarly agreed and under no circumstances should the arrangements be deviated from.

In view of the large staff to be employed in the Euphrates area it may be considered advisable Medical. to establish a section of a Field Ambulance at Hillah. The greater part of the work will have to be performed during the hot season and almost all employees will be working in the open.

Very large payments will have to be made at each Centre and the Financial Adviser should Field Treasury Chest Officers. be asked to consider the advisability of establishing Field Treasury Chest Officers. An endeavour should be made to locate these officers in or very near to the granaries.

From the time the harvest is gathered in, the blockade should be strengthened on our front Blockade. line to prevent the possibility of the leakage of grain to the enemy.

NOTE re PERSONNEL REQUIRED.

It is suggested that the undermentioned personnel will be required —

1. Officers	8	} British.
Non-Commissioned Officers	85	
British other ranks	160	
Treasurers	32	} Indian imported.
Baling supervisors	130	
Baling trained labour	520	
Winnowing trained labour	160	
Head fitters	5	

(2) The non-commissioned officers would act as (1) collecting centre supervisors, grain cleaning supervisors; labour controllers, etc. British other ranks would be storekeepers responsible for receipt and issue of stocks.

It is suggested that there be also 12 machinery supervisors, each responsible for the up-keep and output of a group of baling and winnowing machines. They should have some mechanical knowledge.

All figures include a percentage to meet hot weather casualties.

3. Provision is suggested for—

(a) 1 Indian supervisor and 4 trained coolies *plus* 25 per cent. for each baling machine.

(b) 2 trained men for each hand or power winnowing machine *plus* 33 per cent. Some such skilled labour is essential if out-turn is to be kept up.

4. Provision is made for 5 head fitters. These are intended to form the nucleus of travelling repair gangs to be made up from local labour, as experience proves necessary.

Suggested headquarters are :—Tuerij, Hillah, (2) Kut, Baghdad.

5. Each power driver winnowing machine will require 1 driver and 1 fitter. Possibly these men could be obtained locally. The same applies to staff for suggested power crushing plant at Hillah or Museyib.

6. Treasurers have been included for all stations. They would be necessary for Accounting Work and Statistics even if F. T. C. O.'s are provided.

7. Each non-commissioned officer in charge shaleefs would have a small staff locally engaged for repairs to bags and shaleefs.

8. An approximate estimate of local clerical staff, and more or less skilled labour, is —

Agents	32	Weighmen	600
Interpreters	30	Engine drivers	10
Clerks	25	Engine fitters	10
		Baling labour	520
		Winnowing labour	950

In addition, each collecting centre and sub-dépôt will require, in a varying degree, coolies, bhisties, sweepers, ferashes and watchmen, all of whom might be engaged locally.

APPENDIX K.

Port and Railway Department, Basra and Magil.

The Railway accommodation required initially at Magil was very limited, neither was it then anticipated that the tonnage to be handled would reach the present figure, still less the tonnage which must now be considered.

Additional accommodation to meet the needs of the moment was all that could most easily and quickly be introduced. Thus the present lay-out has grown. It would not have been so designed for present traffic. It is difficult to work and it is incapable of extension to any appreciable extent. It is necessary therefore to reconsider the whole question and devise a comprehensive lay-out, that will not only meet present needs but admit of future extensions.

The lay-out shown in red on the map of Basra and Magil indicates how the port can be approached so as to give access to the wharves as they exist at present, and how these can be added to so as to provide 10 wharves each capable of receiving ocean-going steamers in a less length than that occupied by the port at present. A further two wharves can be constructed within this area.

By closing the existing Inland Water Transport channel behind Coal Island, the Port is capable of a further development to an extent which would almost double its capacity.

Investigations have been made which show that a permanent bridge over the Euphrates by way of Coal Island thus cutting out the present pontoon bridge at Gurmat Ali is a feasible project.

Other extensions have been shown connecting the developed Port to the present Railway system both to Amara and to Nasiriyeh. Whether the connection to Amara is *via* the existing pontoon bridge or is replaced by the suggested permanent bridge on the proposed new alignment, or whether the main line eventually goes to Baghdad *via* Amara or *via* Nasiriyeh makes practically no difference to the project in Basra itself, as now outlined.

The extensions shown are a natural corollary of the development of the Port in order to deal with the increased traffic which will accrue therefrom, as well as to provide increased facilities for its distribution throughout the Base itself.

In the project connections have been provided to the various hospitals which with one or two exceptions are at present served only by road or river, while at the same time facilities of access have been provided to the various offices at Ashar, and for the despatching up-country of personnel from the different camps and depôts.

The alignment of the different extensions has been selected so as to avoid, except within the Port area itself, interfering with permanent buildings or structures. Within that area the interference has been kept to the minimum necessary for the proper working and development of the Port.

As will be seen the project involves the removal of the existing Makina Railway Station or at any rate the traffic part of it. This removal is not so great as at first sight appears as no permanent structures have been put down in the traffic yard, and the removal therefore only entails the ripping up of tracks, all of which can be reused. Arrangements have been made to retain the permanent locomotive yard and the permanent engineering shops, now under construction as part of the new project.

Experience moreover has shown that the present Makina Yard is unsuitable in design for the present traffic, involving as it does shunting across the main lines to get to and from the engine shed, and the dumps and depôts which have sprung up round it, while its location precludes any extensions to rectify matters.

These proposed extensions in the Base itself as well as the alterations in the Port can be carried out without interfering with present facilities as all new work can be constructed while traffic is still being carried on over existing wharves and lines, and when the new work is completed the change over to it can easily be made. It is not of course intended to lay-out the Port as shown to its full extent at once, but the intention is to develop it along the lines indicated as traffic requires.

